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The Engineering and Mining Journal

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Copper Statistics

The discrepancy between the refinery and the mine statistics that has excited much discussion during 1912 has caused an expression of hope that the Copper Producers' Association will undertake the publication of the mine statistics as well as of the refinery. This would not, however, be practicable, nor is it necessary. It is impracticable because the copper originating from many small mines, amounting in the aggregate to a good deal, can never be wholly accounted for by any enumeration short of a regular census, and even such is likely to be in error; while statistics furnished by the smelters on the basis of their blister copper, require so much unraveling, in order to avoid duplications that once a year is often enough for such an undertaking.

Anyway, a monthly investigation of this subject is unecessary because sufficiently indicative figures are already available. We hear it deplored sometimes that there is not now the same association of the producers as there was under the leadership of John Stanton, but in fact the principal producers now not only report their production monthly but they do it openly, and everybody can see whether they are reporting correctly or not. Such has been the progress in publicity during the last five years!

Now, by taking the reports of the principal American producers as thus published, excluding those which smelt imported ore or who send their ore to foreign countries, adding the blister copper imported into the United States and the copper in ore (with an allowance for loss in smelting) and we have accounted for upward of 90% of the raw material made available monthly.

The non-reported copper is chiefly that of the American Smelting and Refining Co. We have no doubt that that company would cheerfully contribute its data monthly if such could be done, but the nature of its business is so complex that it could not furnish data that would not involve danger of duplication unless there were an opportunity for leisurely study and comparison of notes. Anyway, the principal part of its copper output is reported by the mining companies who originate it, e.g. the Utah Copper Co., and the quantity of copper made by this and other smelters that remains unaccounted for in one way or another is only about 8,000,000 lb. per month, which may be estimated with the assurance that an error of even 10% would affect the grand total by less than 1%.

In the following table we have made comparison of the refinery and mine statistics for the first six months of 1912, estimating partially the mine outputs in May and June, for which months the returns have not yet been completely received:

PRODUCTION OF COPPER.

Month	Refiners	Mines
Jan.	119,337,753	139,027,356
Feb.	116,035,809	127,885,749
March.	125,694,601	136,307,674
April.	125,464,644	133,593,481
May.	126,737,836	138,107,729
June.	122,315,240	140,000,000
Totals.	735,585,883	814,921,989

It appears from the above table that the refinery figures are about 80,000,000 lb. behind the mine figures. A small allowance, say about 2,000,000 lb., should be made for smelters who report blister copper rather than the copper content thereof, and a further allowance, say 3,000,000 lb., for the copper recovered by the refiners as bluestone, wherefore the net production of the mines during the first six months of 1912 was about 810,000,000 lb., or 75,000,000 lb. in excess of the production of the refineries. The refinery figures show an advance of about 1,500,000 lb. per month over the average rate of 1910. It was always supposed that the new production of 1912 would amount to an increase of about 150,000,000 lb. during the year. It is in fact running at about that rate. Why the increase has failed to show in the refinery statistics is the point that has been so warmly debated.

We have previously pointed out that the surplus exists in many places, largely in ore rather than as blister copper. Some of the mines report their production as blister copper, but others, including Utah, Ray and Chino, report their output as of copper in concentrated ore, and the Alaska shipments to the United States and the miscellaneous imports of ore are reported in the same way. Undoubtedly there has been an accumulation of ore at several smelteries. In the case of the Hayden plant that will be a permanent lock-up inasmuch as that plant was started with empty bins. However, this represents but a small part of the copper that is unaccounted for. Without doubt the delayed production, wherever it be, is going to come out sooner or later.

Gold Production in Australasia

The returns from the principal states of Australia and from New Zealand are now available for the first half of 1911. They show a continuance of the decrease in gold production, which has now been going on for several years. The accompanying table shows the production for the half year in fine ounces, comparison being made with the first half of 1911. The returns are official except for South Australia and Tasmania, which do not make monthly reports, and for which estimates have been made.

	1911	1912
West Australia	672,860	627,849
Victoria	262,396	245,900
Queensland	184,655	170,400
New South Wales	105,365	94,037
South Australia	3,900	3,500
Tasmania	18,500	17,900
Commonwealth	1,247,676	1,159,586
New Zealand	220,597	199,277
Total	1,468,273	1,358,863
Total value	$30,349,203	$28,087,698

The total decrease this year was 7.3%; it was pretty well distributed, the heavier proportional losses being in New South Wales and Western Australia. No new causes can be assigned for the continued decline in production. In New Zealand it was due in part to the decrease in gold dredging and in part to the smaller output of one or two large mines. In the Commonwealth the older mines are gradually losing in the quantity of ore mined and in the average tenor of the ore. No new mines or districts have been opened, and prospecting seems to be at a low ebb. The prospector, it would seem, has given up the work of hunting for new mines and has gone into other lines of business which promise a better return. The population of Australia increases slowly, and wages in most industries are at a pretty high level. Until conditions change and labor goes into the mining industry instead of leaving it, thus making the working of lower-grade ores commercially profitable, the decline in gold production is likely to continue.

The Properties of Spelter

A subject of investigation that might usefully be undertaken in the physical laboratory of some college is the properties of spelter and what affects them. Spelter is employed for many purposes requiring different properties and we have several broad classes of the commercial metal which are supposed to meet these. Thus, we have high-grade spelter, intermediate, brass specials and ordinary prime western. These classifications are, however, based wholly upon chemical composition, especially the percentages of lead and iron, which are the common, contaminating impurities, although perhaps we should not say "contaminating," inasmuch as a certain percentage of lead is believed to be desirable for certain purposes.

It is found, however, or imagined, that certain spelters of apparently equivalent composition give different results in practice, especially where there is delicacy in their use. Thus, it is said that there is no high-grade spelter that is quite as good as "Horsehead," although some others may analyze as good; we have heard similar differences reported in the case of lower grades of metal.

The expression of these ideas suggests that it ought to be determined if there be truth in them; and, if so, the wherefore and why, which may be due to the presence of small quantities of other metals, not looked for in ordinary analysis, or the physical conditions occurring in the smelting process, or to both. We hope that this matter will be taken up by some physicist and chemist who is interested in the properties of the metals.

Drill Steel

At mines where careful attention is given to the efficiency of the rock drills there is considerable complaint respecting the quality of the steel that is obtainable. It does not stand up satisfactorily to the work. So far as we are aware it is not supposed that the quality of the steel has deteriorated, but rather is it a case of more being required of it to meet the conditions of modern drilling machines, which have been advanced greatly in the intensity of their operation and their mechanical efficiency. The drill builders seem to have outrun the steel makers.

Our suggestion that the American Institute of Mining Engineers ought to concentrate its government in a single body has met with the approval of many members. The present arrangement is absurd. The council is charged with certain duties; the board of directors with others. In certain contingencies the two have to get together in order to act jointly. On the whole, however, the council is a body of no great consequence, and membership in it is an empty honor, although theoretically it is the central and leading factor. There used to be the anomaly of two presidents, one of the council, one of the directors, but common sense has lately corrected that absurdity by electing the same man to both positions. However, the dual control of the Institute is still analogous to the government of Japan under the mikado and the tycoon. Undoubtedly this will have to be changed.

The response to the formation of an Iron and Steel Division of the American Institute of Mining Engineers seems to show that the demand for such a differentiation of the work of the institute existed, as we have always believed. In the short time since the circular of the committee in charge of the new division was issued, over 350 names have been secured, including those of a number of prominent members. A number of papers have been already submitted or are promised for the first meeting. More names are coming in and the new division will have an encouraging start.

Zinc-ore prices in the Joplin market have made a new high record, as much as $66 per ton having been paid last week for a few lots of blende, while the base price for 60% ore was close to $60 per ton.

Recent advances in iron and steel prices seem to be based on legitimate demand. The mills are so full of work that they are finding difficulty in filling orders in time.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

What Is a Stratified Rock?

The question: What is a stratified rock? was raised in the JOURNAL of June 22, 1912. I will endeavor to clear up the fog of misunderstanding.

A stratified structure is one in which there are several layers of the same or different material, one on top of the other, of about the same thickness. The stratification may be horizontal like bedclothes, or again, it may be tilted to an imaginary line.

Stratification is illustrated in physiology by the stratified epithelium; in manufacture, by the stratification tanning, for which purpose an alternate series of layers of bark and hide are laid in a pit; in physics, the bands of interference colors, produced by double refraction, which again occurs in the rainbow, but in both the colored bands grade into one another with no definite line of division.

And so in geology we have strata of rock, which have been laid down, and spread over surfaces by water or other agencies. All beds so laid down are called sedimentary deposits. The most important indication and result of stratification is that the rocks separate more or less easily along the planes separating the beds or strata. Each stratification plane marks a change in the character of the deposit, or a shorter or longer period during which deposition was suspended. Often one stratum is succeeded by another of different character, showing a change in the existing conditions. Sometimes, however, a rock is distinctly stratified, but each stratum separated easily into much thinner layers, closely resembling one another in petrographic character: this is called lamination. In some cases the apparent stratification seems to be of the nature of an imperfect cleavage, there having been a certain amount of rearrangement of the particles of the rock parallel to the planes of deposition.

As to the solidified volcanic ash *in situ*, it is neither stratified nor eruptive. The ash as it came from the volcano was undoubtedly eruptive; but nevertheless, as it fell into the lake, and was consequently deposited by settling through the water continually until the eruption subsided: it is designated at this stage as sedimentary. Again, as all the ash fell contemporaneously, and formed a thick bed of mud, it cannot be stratified. While on the other hand, if the volcano was active intermittently, and threw out ash at these intervals, and each of the layers solidified before the next was deposited; then, and then only, would we have a series of layers or stratified rock.

As to the plastic rock in question, it is sedimentary after settling through the water of the lake. If both the ash and débris from the plastic rock are considered together, solidifying in their order of deposition, we would then have a stratum consisting of two distinct layers of rock.

S. S. MCNAIR.

Cape Girardeau, Mo., July 15, 1912.

Preparing Furnace Charges and Modern Lead Smelting

An editorial in the JOURNAL of July 13, 1912, gives the impression that careful preparation of furnace charges for lead and copper smelting is comparatively new. This preparation, with the view of getting uniform materials into the furnaces, has, however, been in constant use at all the works with which I have been connected ever since the autumn of 1876, and has gradually been introduced into many other works. The methods of doing this naturally have been improved gradually, mainly in the line of more economical handling of the ores, but there has been no change in the principle.

This preparation comprises:

(1) The physical condition of the ores—suitable average size and average moisture, as well as the best available proportion of raw oxidized and of roasted, preferably sintered, ore.

(2) The chemical composition of the ore beds, which must usually be made up of perhaps 20 or 30 different ores, such as the custom smelter must buy, mostly in small lots, a part of which must first be roasted and sintered. For convenience in subsequent operations these beds are purposely made up in three classes; siliceous, basic and nearly neutral.

(3) The absolute minimum of firm coke of a given analysis, which will accomplish the desired reduction of the various constituents of the ores, and furnish in addition all the heat units necessary for melting the metals, matte, speiss and slag; but no more. Even a small surplus of coke is apt to do as much mischief as a faulty chemical composition of the charge; in fact it may undo a correct chemical composition made for the desired ultimate results.

The paragraph in regard to what the present large furnaces will do, or permit to be done, is also rather misleading. While the large furnaces naturally respond more slowly, in terms of time, to abuses of faulty charges, etc., they, too, show at once by much slower running, bad slags, and various obstructions both in the shaft and in the hearth that something objectionable has been done; and if the proper means are not at once employed to correct matters, even a large furnace may freeze up. At best it will lead a sickly and costly existence for a much longer time than is desirable for a healthy balance sheet.

In an editorial on p. 2 of the JOURNAL of July 6, 1912, after paying a well deserved tribute to the uptodate modern appliances of the smelting works of the International Smelting & Refining Co., it is stated: "And, finally, as an innovation, the time-honored practice of bedding the furnace charges has been discarded in favor of an actual weighing out of each constituent. The last feature results in a perfection of mixture, which is said greatly to promote the running of the blast furnaces, which, of course, is in the line of what ought to be expected."

I cannot see any innovation here, since the correct weighing of furnace charges, including fuel, dates back over 30 years. If the International has very large and very uniform lots of ore to treat, there is of course, no necessity of bedding. But I have found, during a long practice, that even the ores coming from large bodies in the same mines are rarely as uniform chemically and physically as to permit smelting them from a pile, instead of from regular and carefully spread beds. In the latter case, you are sure to get the desired slag and such conditions in the furnace as give the best final results.

It is possible that the writer had in mind the fact that the International roasts and sinters a large amount of ore on the Dwight & Lloyd machine, the different ores being fed to the same simultaneously in certain set proportions. This gives as a result one uniform ore, chemically and physically, and serves the same purpose as bedding. But this manner of handling cannot be advantageously applied where beside the roasting ores a large proportion of coarse oxidized ores must be treated. There the bedding cannot be dispensed with to advantage, as far as I can see, for it would not be economical to weigh into the charges 20 or 30 different ores instead of one bed, the composition of which is known to a nicety.

In other words, what Mr. Mathewson may be doing at the International works, because the kinds of ore he has to treat make his manner of treatment the most advisable and cheapest, cannot necessarily be found as efficient at other works, where ore delivery is entirely different. Generalization in this respect is as yet impossible.

A. EILERS.

New York, July 18, 1912.

Food Supplies for Miners

The lists of food supplies provided for miners in Alaska and at Cobalt, recently published in the JOURNAL, are of especial interest to the managers of those mines so situated as to make it necessary to operate company boarding houses. At many mines the operation of the boarding house is a minor detail. If conveniently situated in regard to markets, standing orders for supplies can be issued and the superintendence of the department delegated to the steward. At other places the boarding house is often the *bête noire* of the manager's existence. Especially is this apt to be true at mines in the tropics remote from markets, and at properties situated in temperate climates, but only accessible by traversing hot lowlands, through which perishable food supplies cannot be transported.

The difficulty in such a situation is not the expense of obtaining food in sufficient quantity, but in being able to obtain sufficient variety. The tendency toward anæmia in the tropics must be combatted by nutritious diet, for unless well nourished the employees are easily susceptible to the many tropical maladies. It is, as a rule, unprofitable to try to operate a mine with men half sick. To keep men healthy they must be well fed, the food must be palatable, and there should be sufficient variations in the menus from day to day, so that the men will not lose their appetites, which will surely follow meals of substantially the same foods day after day.

This is the most difficult problem to solve, because the country cannot be depended upon to furnish a great variety of nutritious food supplies. Wheat, potatoes, peas and beans cannot be grown satisfactorily in the tropics. Rice, yams, plantains and cassava can be easily cultivated, but are too starchy for extensive use.

Starchy foods are all too extensively used in the tropics. It is, therefore, usually necessary to import the more nutritious staples for the foundation of the meals so to speak, and to use green vegetables that can readily be grown in most places to tempt the appetite.

A mistaken idea about eating meat and fruits prevails among the majority of Americans residing in the tropics. Except for the citrus fruits, it is well to eat fruit but sparingly and infrequently; meat is one of the most valuable and necessary foods to prevent anæmia and malnutrition. The trouble is that most Americans object to eating fresh meat and in the tropics meat is usually eaten the day it is killed. Moreover, at small mines the number of men that must be provided for is not great enough to entirely consume a small steer in a day, and the waste is so great that meat is rarely provided.

This waste may be prevented by salting the meat that is not immediately required for the table. An excellent procedure is to place the meat in tubs set in a cool, shady place and cover with brine strong enough to float an egg, and in which ½ oz. of saltpeter has been dissolved for each 100 lb. of meat. Meat kept in this way can be used immediately and if the brine is removed, the beef washed and again covered with fresh brine, it can be kept perfectly for a week or ten days. For the first few days the meat will not be appreciably salty.

The most satisfactory procedure at even a small mine is to install an ice-making machine and build a chill room. A small ice machine sufficient for a mine employing 150 men can be purchased for $1000. The cost of installation and building a chill room is nominal; the cost of operation negligible. With such a plant it is possible greatly to increase the efficiency of the men.

Many are the complaints made about the inefficiency of the natives of the tropics. The cure lies not in complaining, but in providing proper and nutritious food.

C. C. S.

New York, July 15, 1912.

Copper Smelting at Kyshtim

In my notes on the Karabash plant in the JOURNAL of June 22, the statement regarding the relative amounts of air for converting mattes of different grades should read, "the air required to convert matte containing 26% copper costs about half as much as that required for matte containing 16%." A typographical error made the first figure 20 per cent.

ERNEST J. CARLYLE.

London, Eng., June 22, 1912.

"Airing Off" of a Mine

A Michigan iron-ore mine was recently closed temporarily. Three days later the engineer had occasion to visit some of the recent workings which had been left either timbered (as the ore was soft) or well trimmed. He found that the back of drifts which had held up for months had suddenly come down, so that in one or two cases he had difficulty in crawling through. At the face of one heading where particular care had been taken to leave it well trimmed the ore had bulged or swelled, making a fairly large pile of muck.

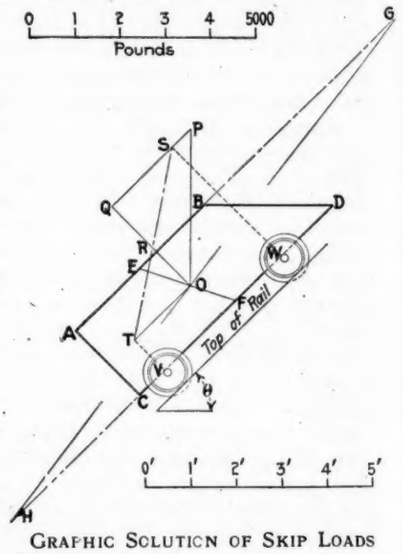
An old miner called the process "airing off" and said that he had often seen it occur when operations ceased in a mine. Is the occurrence caused by stoppage of ventilation or what is the explanation?

OCCASIONAL CONTRIBUTER.

Ishpeming, Mich., July 15, 1912.

Graphic Solution of Skip Loads

I have been reading E. R. Rice's discussion of the above problem in the JOURNAL of July 13, p. 54, and wish to ask about his mathematical assumptions. To find the point *O* (center of mass), he bisects *AB* and *CD* and joins their centers. He prolongs *AB* a distance *CD*, and prolongs *DC* a distance *AB*, joining the points thus found. The intersection of this with the line bisecting *AB* and



GRAPHIC SOLUTION OF SKIP LOADS

CD is then assumed to be the center of mass of the car. As a matter fact, is it not true that *O* is merely the center of mass of a plane surface *ABDC*? It would appear that *O* cannot be the center of the mass of the skip body, for there is no compensating surface at the front of the skip to make up for the one at *AC*, unless perhaps the bail acts as one.

But the center of mass of the top and bottom of the skip, represented in section by *AB* and *CD*, would not lie upon a line perpendicular to plane *ABDC* through *O*, but below it. There is, moreover, the uncounterbalanced weight of the wheels to lower the point *O*. I cannot suggest the exact solution of the problem of the center of mass in this case, but it seems certain that it lies somewhere toward the point *C*, from where it is located by Mr. Rice.

C. E. CASE.

Pittsburgh, Penn., July 15, 1912.

Closing a Gas Well in Hungary

In drilling to explore for deposits of potassium salts in Transylvania, natural gas under 420-lb. pressure was found at Kis Sarmas at depths of less than 1000 ft. After plugging the well, surface disturbances resembling earthquakes occurred, ascribed by some to faulty closing of the well; by others to tectonic movements.

Note—Excerpts from an article by A. Strobl, published in the Journal of the Society of Hungarian Engineers and Architects of America, 29 West Thirty-ninth St., New York, and entitled "Natural Gas in Hungary and the Gas Well at Kis Sarmas."

Hungarian geologists have long been of the opinion that in the eastern parts of Hungary strata containing gas, oil and salts of potassium must exist. The Hungarian government decided to bore extensively in order to find salts of potassium.

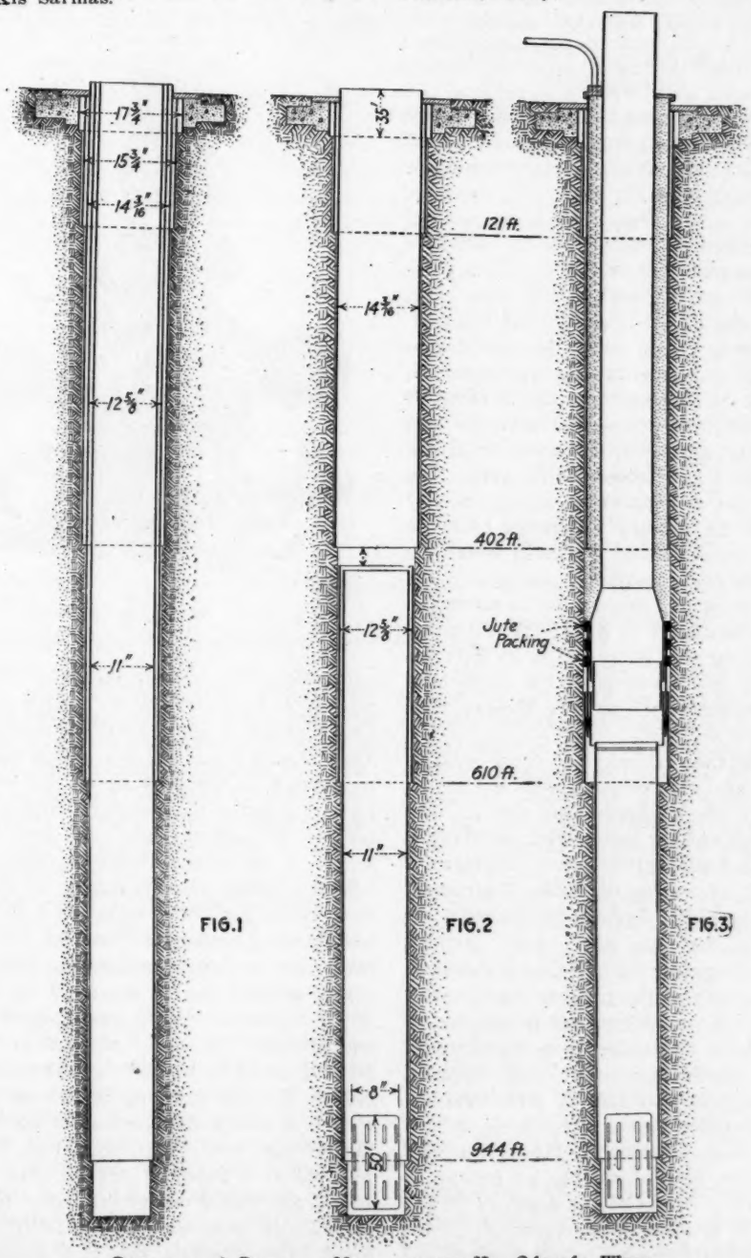
The first hole was started near the village of Kis Sármás, in 1907. After drilling to a depth of 2056 ft., where traces of natural gas were found, it became necessary to discontinue on account of the slipping of the sandy strata. On Nov. 26, 1908, the second boring was commenced at a distance of about 1000 ft. from the first. Natural gas appeared at small depths, and the quantity increased with the depth of the well. The drilling was continued, but the gas escaped from the strata under such pressure and in such a quantity as to compel suspension of the drilling at a depth of 991 ft. No salts of potassium were found, but an excessively rich natural-gas region was discovered.

Oil and Gas a State Monopoly

The Hungarian government presented a bill to the parliament, in which it was proposed to make a state monopoly of oil, gas and salts of potassium. The bill passed the legislature in October 1910, although it was opposed by landowners. The government ordered the immediate exploration of the whole Transylvanian valley. The geologists thought that, as in the gas and oil fields of America, the gas would rise to the axes of the anticlines, the oil being found on their flanks and the salt water in the synclines. The result of the researches was that more than 20 anticlines were discovered on an area of 60x100 miles running in a direction approximately north and south. The gas well at Kis Sármás is also situated on the axis of an anticline. The work is proceeding with dispatch, 10 holes now being drilled at Kis Sármás and several others are planned. The budget of the Minister of Finance provides 2,700,000 crowns (about $540,000) to be expended for drilling during the fiscal year.

At the drilling of the well at Kis Sármás, which commenced Nov. 26, 1908, traces of gas were found at a depth of 72 ft. After that several gas strata were struck. The sands at a depth of 374, 525, 629, 680 and from 746 to 990 ft. furnished greater quantities of gas. At a depth of 374 ft. so much gas appeared that the petroleum lamp in the drilling derrick ignited it and caused an explosion. It took 10 hours to extinguish the immense flames.

The gas coming from a depth of 525 ft. threw the water column from the hole to a height of 65 ft. After reaching down 629 ft., the well was shut off, for a short period, and the manometer registered 60 lb. although the closing of the well was imperfect. The pressure of the gas coming from a depth of 680 ft. was found to be 270 lb., the quantity being 134,178 cu.ft. per hour. The strata between 746 and 990 ft. deep developed a pressure of 420 lb. and the amount of the gas delivered by the well increased to 1,270,000 cu.ft. per hour, that is, 30,480,000 cu.ft. per day. The average velocity of the gas was 620 ft. per second. The tremendous force of the gas made it impossible to continue the boring. This well was finished on April 22, 1909. For a long time there was a free escape of gas which could be heard several miles away.



Casing and Packing Used in the Kis Sármás Well

Professor Pfeifer's tests show that the gas contains 99.6% methane (CH_4), which makes it an ideal fuel. Its heating power is 960 B.t.u. per cu.ft. The amount of gas furnished by the well of Kis Sármás represents about 60,000 hp. per day when used to raise steam for steam engines. In order to prevent the large waste of gas, until such time as it could be used for industrial purposes, a method of closing up the well had to be devised. It was hoped that the problem might be solved by setting a valve on the top of the casing. This hope was based on the belief that the clay beds drilled through were closely pressed against the outside of the casing and therefore would not permit the escape of the gas on the outside. This expectation seemed to be justified, moreover, by the fact, that in America the closing of many high-pressure wells has been successfully carried out in this manner.

First Attempts to Close Well Unsuccessful

The closing head consisted of a heavy iron valve weighing several hundred pounds. The first closing experiment was made June 22, 1910. The well remained closed from 5.50 a. m. to 7.30 p. m., during which time the pressure rose progressively to 405 lb. This pressure remained constant for one hour, after which the valves were opened. They were closed again the next day at 6 a. m. and remained so until June 24, at 2 a. m. As early as the morning of June 23, it was observed that gas was escaping some 100 ft. away from the hole, in a ring about 50 ft. wide. The escape of gas increased during the day and in the evening rumblings could be heard in sections of the earth where the gas had not previously escaped. The eruption of the gases grew so strong on the same day at 11 p. m., that the pressure in the well decreased to 75 lb. while the gas emitted through the earth blew the ground water up like springs to a height of six feet.

It became evident that there was no other way to close the well except by packing the outside of the casing. The work of packing was started on May 19, 1911, and was carried out by Thumann, a drilling contractor of Halle (Germany). It was a great handicap in designing the packing that the pipes were strongly pressed against the hole, and therefore the location of the packing could not be chosen; it was determined in advance by conditions. The pipes were of relatively large diameters as they were intended originally to pass salts of potassium and not for natural gas.

The hole, as shown in Fig. 1, was lined with five sets of casing, as follows:—17¾ in. diameter to the depth of 35 ft.; 15¾ in. diameter to the depth of 121 ft.; 14 3/16 in. diameter to the depth of 402 ft.; 12⅝ in. diameter to the depth of 610 ft., and 11 in. diameter to the depth of 944 feet.

The last 46 ft. of the hole was not cased. The gas could be prevented from escaping up the circumference of the drilling by tightening the hole. By this means it would be possible to collect the gas coming from the deepest and richest sand into the innermost pipe, while the gases of the higher strata would rise separately into the space between the respective pipes. But after taking off the closing head and trying to lift the pipes it was discovered that all were so strongly wedged in place that it was impossible to pull them out and they could not be packed for this reason.

No Choice in Position of Packing

After several trials, it was found that the only free position was a pipe 32 ft. long, a part of the 12⅝-in. casing, situated below the end of the 14 3/16-in. pipe at a depth of 402 ft. Under such circumstances it seemed evident that this was the only place where a packer could be applied as the packing of the other pipes was out of the question. The location of the packer would have been selected in any event above the sand at 525 ft., which was furnishing a great quantity of gas, there being no hope of saving the gas coming from the 374-ft. sand. The records of the boring showed a bed of hard clay at the depth of 400 to 416 ft., and this depth was selected for the packing. In order to prevent the slipping of earth in the last unprotected section, a perforated pipe 50 ft. long and 8 in. in diameter was lowered to the bottom of the well. Then the 11-in. pipe was cut at a depth of 421 ft. (Fig. 2) and it was pulled out of the hole. Next the 12⅝-in. pipe was cut at 418 ft. and lifted Consequently the hole between the depths of 402 to 418 ft. was deprived of its casing, and the packer as shown in Fig. 3 was placed here.

The packer is mounted on a pipe of 8-in. diameter and consists of four jute cylinders, of which the three upper tighten the space between the packer pipe and the hole and the lower (fourth) cylinder tightens the space between the packer pipe and the 12⅝-in. pipe. Into the space between the 8- and 14 3/16-in. pipes cement mortar was pumped, thus completely filling out the space between the two pipes and also that between the 8-in. pipe and the circumferential wall of the hole. The spaces between the other pipes of greater diameter were also filled out with cement. Fig. 4 shows a perspective view of the closing head and Fig. 5 a section of the same, showing the method of anchoring.

After the cement became hard the valve head was again mounted, the valves closed and consequently the pressure of the gas reached progressively 420 lb. It has been constant since that time. The work of tightening was finished on July 30, 1911.

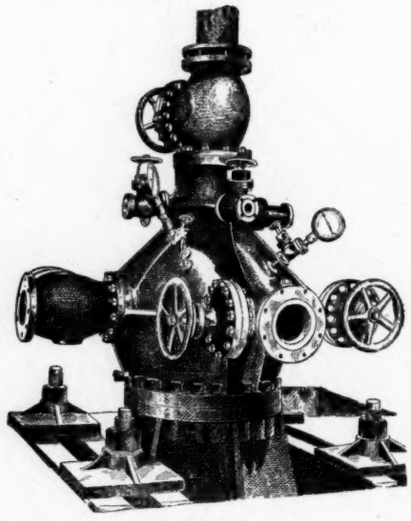


FIG. 4

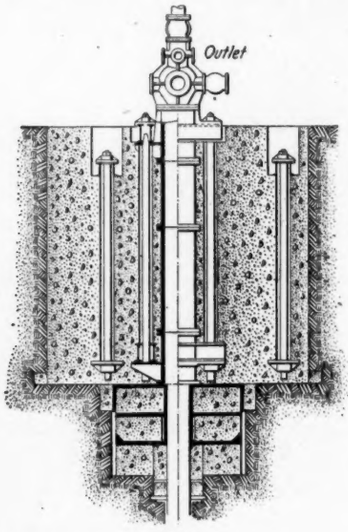


FIG. 5

Closing Valve and Means of Anchoring It to the Casing.

Disturbances Follow Closing of the Well

Opinions differ widely concerning the correctness of this method of packing. On Oct. 29, 1911, there was a sudden eruption, like an earthquake, in the vicinity of the gas well of Kis Sármás. The gas burst out with great force at a distance of about 1400 ft. from the well, and within a radius of 1000 ft. it threw the earth to a great distance. From the craters escaped an immense quantity of gas, estimated later at several millions of cubic feet. This was ignited by a lamp burning in a nearby house and it burned with an immense flame. It was difficult to extinguish the fire, and its quenching

was accomplished only by throwing wet earth into the fissures in such a manner as to prevent the escape of more gas. No change could be noticed in the condition of the gas well. The pressure remained constant at 420 pounds.

Naturally, the question arose whether there was any relation between the eruption and the well and became the subject of a lively discussion among experts. It is not settled yet. There are two widely different opinions. One party, including Mr. Böhm, the resident engineer in charge of the borings, contends that the eruption was entirely independent of the well and that its cause was purely tectonic. Professor Cholnoky, Professor Pfeifer and others assert that the faulty packing of the well was directly responsible for the outburst.

According to the first-mentioned opinion, the more recent soil layers did move, which would have been the case even if the soil had not been disturbed by boring. Mr. Böhm urges the tectonic theory, stating that the well has shown a constant pressure of 420 lb. after the explosion, which would not have been the case if there had been any relation between the well and the eruption. Before and after the eruption, shakings were felt in the vicinity and the groundwater rose above the soil level, which phenomena usually attend earthquakes. Cholnoky and Pfeifer maintain that the eruption was caused by the insufficient packing of the well. The packer is at a depth of 416 ft. and it shuts off only the higher conducting regions. The gases coming from the deepest and richest layers are not shut off, and they transfuse into the next conducting layer, above which there is a layer of clay. All the layers rise toward the surface. The transfusion was slow on account of the frictional resistance, but at last the pessure grew so strong in the upper conducting region that its force blew up the covering clay layer at a point where it rose nearest the surface. For proof of the existing diffusion, they refer to American wells in which the gas reaches its maximum pressure within a few minutes after the closing of the valves, while at Kis Sármás the maximum was only reached after 37 days.

Mr. Pfeifer believes that the packer should have been placed, as in all American wells, right above the conducting sands and not 95 ft. higher. He suggests the abandonment of the well and the drilling of another, which would be driven with knowledge of what might be expected, and he wants the work done by an American expert.

Several projects to utilize the natural gas have been discussed. For the present the government wants to utilize the gas for industrial developments. Among the enterprises to be undertaken in the near future there is one which will directly use the heat of the gas flames to produce potassium nitrate. This factory will use 7,000,000 cu.ft. daily. Another group of interests, backed by the Solvay Co. of Brussels, intends to invest 4,000,000 crowns, and expects to manufacture chloride of lime, etc., by the electrolytic process.

The Cement Industry in 1911

The statistics of cement production in 1911, prepared by Ernest F. Burchard, of the U. S. Geological Survey, show an increase in quantity, which is the smallest recorded within the last 13 years, and the fact that the total value showed a decrease indicates that trade conditions were not as satisfactory in 1911 as in 1910. The total quantity of portland, natural and puzzolan cements produced in the United States during 1911 was 79,547,958 bbl., valued at $66,705,136. In 1910 the production was 77,785,141 bbl., valued at $68,752,092.

The total production of portland cement in the Unted States in 1911 as reported to the U. S. Geological Survey, was 78,528,637 bbl., valued at $66,248,817, equivalent to 13,321,822 long tons, at $4.97 per ton. The production of portland cement for 1910 was 76,549,951 bbl., valued at $68,205,800. The average price per barrel in 1911 was a trifle less than 84.4c., as compared with 89.1c. in 1910. In the average price for the country is included the value of 135,775 bbl. of white portland cement which sold at an average price of about $2.50 per barrel.

Production by Commercial Districts

The United States has been divided into 11 subdivisions based on the grouping of plants in direct relation to the trade territory covered by each group. This grouping is also logical when the raw materials are considered. For instance, the plants in northeastern Indiana and northern Kentucky, all of which are near Ohio River and all of which use hard limestone, are grouped together. Plants near Chicago, whether in Illinois or Indiana, are grouped together because of their nearly equal freight rates. The Southeastern States, in which plants use mostly Appalachian limestone, are grouped together, and central Texas is included in the group of Great Plains States. Plants between Missouri River and Mississippi River in Missouri and Iowa are grouped together and the plants in the Rocky Mountain States and western Texas are considered in a group intermediate between the Great Plains and the Pacific Coast. The accompanying tables summarize the statistics for each district.

Lehigh District Produces $18,000,000 Worth

The Lehigh district of eastern Pennsylvania-New Jersey has, with three exceptions, shown a steady increase in production each year from 1890 to the present time. The years in which slight decreases are recorded are 1893, 1908, and 1911. The first two decreases were coincident with years of general business depression, but the decrease in 1911 may, perhaps, be in large part attributed to an over production in 1910. The production for 1911 represented a decrease in quantity of 343,251 bbl., and in value of $619,845, as compared with the production of 1910, an average decrease in price of 1.4c. per barrel.

1911 PRODUCTION OF PORTLAND CEMENT BY DISTRICTS

District	Active Plants	Production 1911 Barrels	Change 1911 Per Cent	Average Factory Price Per Bbl.
New Jersey and eastern Pennsylvania (Lehigh District)	24	25,972,108	— 1.30	$0.715
New York	7	3,314,217	+ 1.54	0.805
Ohio and western Pennsylvania	9	6,756,313	+11.25	0.766
Michigan and northeastern Indiana	13	4,519,726	— 0.11	0.827
Kentucky and southern Indiana	3	2,818,820	— 0.21	0.793
Illinois and northwestern Indiana	6	8,617,341	+ 2.88	0.791
Southeastern States (Maryland, Virginia, West Virginia, Tennessee, Georgia and Alabama)	11	4,049,063	+31.85	0.793
Iowa and Missouri	7	6,067,449	+ 6.02	0.862
Great Plains States (Kansas, Oklahoma and central Texas)	17	7,010,396	— 9.23	0.834
Rocky Mountain States (Colorado, Utah, Montana, Arizona and western Texas)	7	2,124,930	— 4.99	1.186
Pacific Coast States (California and Washington)	11	7,278,274	+13.98	1.406
Total	115	78,528,637	+ 2.58	0.844

In 1911, 115 plants reported a production of portland cement as compared with 111 plants in 1910. The total number of rotary kilns in the producing plants was 916 as compared with 902 in 1910. These kilns ranged in length from 40 to 240 ft. The kiln lengths were as follows: 40 to 60 ft., 208 kilns; 60 to 90 ft., 149 kilns; 100 ft., 84 kilns; 110 ft., 140 kilns; 120 ft., 86 kilns; 125 ft., 163 kilns; 125 to 140 ft., 60 kilns; 150 ft. or more, 26 kilns. The gains were all in kilns 100 ft. or more in length, and these gains more than balanced numerically the smaller kilns which were shut down, giving a total of 559 kilns 100 ft. or more in length in 1911, as against 473 kilns in 1910. The 125-ft. kiln is apparently still the most common length for modern kilns.

Nine New Plants Begin Operations

The following nine new plants reported their first commercial output in

1911: Golden State Portland Cement Co., Oro Grande, Calif.; Piedmont Portland Cement Co., Portland, Ga.; Lehigh Portland Cement Co., Mason City, Iowa; Chanute Cement Co., Chanute, Kan.; Tidewater Portland Cement Co., Union Bridge, Md., Michigan Portland Cement Co., Chelsea, Mich.; Knickerbocker Portland Cement Co., Hudson, N. Y.; Clinchfield Portland Cement Corporation, Kingsport, Tenn., and Inland Portland Cement Co., Metaline Falls, Wash. In addition one plant in the Lehigh district, which was idle in 1910, reported a production in 1911. Against these there were 6 plants idle in 1911 that produced cement in 1910, distributed as follows: One each in Arizona and Pennsylvania, two in Michigan and two in New York.

The International Nickel Co.

An agreement has been made for the consolidation of the International Nickel Co. with the Colonial Nickel Co., a corporation recently organized in New Jersey. This agreement is subject to the approval of the stockholders, and a special meeting for that purpose has been called for Sept. 5 next. The International Nickel Co. has now outstanding $11,583,626 common and $8,912,626 preferred stock, with $8,000,000 in bonds; while the authorized capital stock of the Colonial Nickel Co. is $9,000,000. The consolidated company will be known as The International Nickel Co., and will have $12,000,000 in 6% preferred stock and $50,000,000 in common stock; the bonds will be retired.

A statement issued to the stockholders says that $9,000,000 in cash is to be contributed by the shareholders of the Colonial Nickel Co., which is to be used to retire the outstanding bonds of the International Nickel Co. For this money, common stock of the consolidated company is to be issued at par, but by agreement made with stockholders of the Colonial company the stockholders of the International Nickel Co. are to be given an opportunity to purchase this stock at par *pro rata*. The Colonial company has arranged the underwriting of such stock as shall not be taken by the stockholders of the company.

The consolidated company will acquire all the assets of the present International Nickel Co. and will also receive $9,000,000 in cash with which to pay off the outstanding bonds and will have a large amount of stock in the treasury, available as required for the growth of the company's business. Holders of preferred stock of the company will receive in exchange an equal amount of preferred stock of the consolidated company, and this new preferred stock will become a first charge on all the assets and earnings of the company, as the outstanding bonds will be paid off. Holders of the common stock of the International company will receive 2½ shares of the common stock of the consolidated company in exchange for each share of their present holdings. The capitalization of the consolidated company will be as follows: Preferred stock issued, approximately, $9,000,000; authorized and reserved in treasury, $3,000,000; total preferred stock, $12,000,000; common stock issued, approximately, $38,000,000; authorized and reserved in treasury, $12,000,000; total common stock, $50,000,000. Stockholders of the International company will have the privilege of subscribing at par for the new common stock to the extent of seven-sixteenths of their present holdings.

It is reported that the company has secured some promising claims in the northern part of the Sudbury district; and that these claims will be developed as soon as they are made accessible by the new line of the Canadian Northern R.R., which is now under construction.

The International Nickel Co. at present owns or controls the Canadian Copper Co., Sudbury district, Ontario; the Orford Copper Co. of New Jersey; the Nickel Corporation of Great Britain; and the Société Miniére Caledonienne of New Caledonia.

Another Steel Investigation

WASHINGTON CORRESPONDENCE

The Interstate Commerce Commission has decided to make an investigation into the rates, practices, rules and regulations governing the transportation of cement, iron ore, iron and steel and their products, which will be practically an inquiry into the doings of the United States Steel Corporation. To this end it has issued an order directing such an investigation, in which there is called for "a proceeding of inquiry and investigation instituted by the Commission on its own motion into the rates, practices, rules and regulations of common carriers subject to the act to regulate commerce, as amended, governing the transportation of cement, iron ore, iron and steel and their products, and the material used and consumed in the mining or production thereof, to all points in the United States east of the Mississippi and north of the Ohio and Potomac Rivers, described as Official Classification territory."

It is understood that this investigation is intended to be primarily an inquiry to ascertain whether any "common carrier subject to the Act to regulate commerce, as amended, owns or has any interest in, by means of stock ownership in other corporations or otherwise, any of the above-named articles which it, directly or through other companies which it controls or in which it has an interest, transports over its line as a common carrier, or in any manner owns, controls, or has any interest in mines from which iron ore is taken; whether there is common ownership or control of, or interest in, directly or indirectly, by means of stock ownership in other corporations or otherwise, any common carrier and the mining or production of any of the above-named articles; and whether persons, firms, or corporations having substantial interests in the one, by direct ownership or the holding of stock or securities of common carriers, corporations mining or producing the articles above named or other corporations, or otherwise, occupy, or are represented by persons occupying positions of control in the other."

Turner Emerald Mine in North Carolina

An important feature of the gem-mining industry of the United States during 1911 was the result of prospecting at the Turner emerald mines, near Shelby, N. C., says the U. S. Geological Survey. Gems valued at $100 to $200 per carat have been obtained, and average run of stones is probably as good as the South American.

Up to December, 1911, prospecting consisted of digging several trenches, the largest of which was over 100 ft. long, and two to 14 ft. deep, done by Messrs. Turner and English. The property was taken under option and lease by Lovat Fraser during late 1911, and prospected more thoroughly. It has now been bought by Mr. Fraser and E. P. Earle.

In all about 2700 carats of rough gems have been found, from which about 200 carats of gems have already been cut, and about 700 should be obtained from the entire lot. The average value of the cut stones is about $15 per carat, with a range from $5 to $200.

The theory of the origin of the emeralds at the Turner mine may be summarized thus:

Chromium-bearing basic rock was intruded by granite magma either before or after final solidification of the basic rock. There was a partial absorption of the latter by the granite magma and some of the constituents of the basic rock were taken into solution. Pegmatite veins, in which distinct crystals were only partly developed, formed during the cooling of the rocks. The elements necessary for the formation of beryl were present in the magmatic solutions producing pegmatite, as in some other places in the region. Chromium oxide necessary to impart a color to the emerald was obtained by the action of solutions on the basic rock. A curious coincidence is the fact that the per cent. of Cr_2O_3 in the basic rocks at the Turner mine is about the same as that found in emerald from Colombia.

Should the theory of origin outlined above be essentially correct, prospecting

in areas where similar rock associations occur might disclose other deposits of emeralds. Of course, it should not be expected that every pegmatite associated with the rocks mentioned will carry emerald, for beryl has been found with only a small proportion of the large number of pegmatites occurring in the region. Besides chromium-bearing basic rock and pegmatite, the presence of the elements of beryl in the original pegmatite-producing solutions would be necessary.

Buying and Selling Mines

By W. Weston*

With *"Caveat Emptor"* for their text, many able writers in technical journals have, from time to time, discoursed on the advisability, or rather the absolute necessity of the services of a trained and honest engineer being secured by those entertaining the purchase of a mining property, and the result has been that no deals of any magnitude are now made, except in the manner indicated. Time was—say 25 years ago—when the rough and ready "honest miner" in a blue shirt and his trousers tucked into the top of his boots, his mouth full of tobacco, and his pockets filled with specimens, or perchance with a small bag of nuggets or a little vial of placer gold, from the property which he had for sale, could visit an Eastern city and be received at once by the promoter, or the "rich sucker," (as they were politely termed,) but *"nous avons changé tout cela"*—mines are bought and sold now on strictly business principles, and the vendor of a property has to present it accompanied by a report made for him by an engineer of repute and technical training, otherwise it will not be entertained, and then this engineer's report has to be corroborated, or otherwise, by an engineer who examines the property for the buyer, and this is as it should be.

The Old Way Still Being Tried

Of course even now one hears occasionally of a case where a man of polish and education, with good introductions and a fair amount of capital of his own, gets hold of a big property on option, goes to London, and being without scruples or technical knowledge, makes a flashy report, which could not hold water for a minute under expert criticism, but which is accepted by a few wealthy men on the strength of his introduction, or as sometimes happens, on the fact of their all belonging to the same religious sect, the promoter usually closing the business at a private house where, with his feet under "the victim's" mahogany, and a good dinner under their belts, they are mellowed into putting down their names for the money required, the spending of which is also often unfortunately entrusted to the "untutored mind" of the man who has thus adroitly separated them from their "bag of pounds." This has but one result, and fortunately rarely happens now.

But while much has been written about the buyer's end of it, little has been said or written about a seller's end and the necessity of his furnishing a well accredited engineer's report describing his properties.

Two instances have come under my notice lately, almost identical, except in the personality of the two individuals controlling the properties—both wishing to sell on account of advanced age and a desire to clean up—price of each property in the neighborhood of two million dollars, and no engineer's report, plans, maps, or even an intelligently written description of the property, which would induce any capitalist, or syndicate of capitalists, to give the matter five minutes of their time, or five cents of their money, in investigation. A man who owns a property for which he asks two million dollars can certainly afford to pay an engineer 0.1% of that amount to put it in proper shape for presentation to capital, and in such a work $2000 would ordinarily be a very moderate fee. But "No," they say, "there's the property; it's for sale; you can send your engineer to examine it. I don't care to tie it up at present, but if after the examination you want to do business, we will talk about an option." This is the line of talk a purchaser or his agent often gets. The engineer may have to come from New York or London, and it does not occur to the vendor that no purchaser of any sense would dream of going to all that expense unless a report on the property, price, terms of payment and option, giving ample time for examination, preliminary negotiations, and assurance of certain delivery, were first given in writing.

Attitude of Vendors Blocks Sales

This vendor's plan is exemplified in a coarser way by a miner in the boom days of Cripple Creek, who, swelled up by the ownership of a really rich claim, when approached at his mine by a well known and wealthy operator who desired to purchase, said in answer to a request for time for examination: "Jaw-bone don't go. Come up on the doomp wid yer wad."

But the days of snap action and "stand and deliver" terms of purchase, rich tenderfoot buyers of mines, or sales of claims on picked specimens of ores and pocket-worn gold nuggets, have long since vanished, never to return; mines are bought and sold on scientific lines. The purchasing public has become educated to proper methods.

Not so, however, or not in the same ratio, the owner and vendor, who has yet much to learn. The self-sufficiency and arrogance of the owner of a really good property is too often a bar to a sale, and not until he has been turned down many times, and had many rebuffs from strong people on account of his prohibitive terms, does he realize that it takes two to make a bargain, and that they must meet one another half way.

A point often lost sight of in negotiating for a purchase of a property, is the fact that an option is *de facto* a bond for a deed, and while the option may be drawn up in legal and binding form, unless a valid deed can be given, the option is worthless. The latter, therefore, should be accompanied by an abstract of title, or the certificate of an attorney in good standing that he has examined the title and found it clear and unassailable. This was exemplified the other day in a Western state, in a purchase which involved the expenditure of a million and a half dollars. The president of the company gave an option in perfect good faith, but on examination of the title by the purchaser's consulting engineer it was found that some of the claims which belonged to the company had not been properly deeded to the same by the owners. This made the option valueless and the president had to reorganize his company before he could give an option that was really what it purported to be, i.e., a bond for a deed.

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Analysis of Pig Iron Production

The annual report of the American Iron & Steel Association, just published, adds to our previous statistics a complete analysis of the production of pig iron in 1911, according to grades, which is of much interest.

The complete classification of pig iron made for two years past is as follows, in long tons:

	1910		1912	
	Tons	Per ct.	Tons	Per ct.
Foundry iron	5,144,635	18.8	4,397,729	18.6
Ferrosilicon	115,812	0.4	71,211	0.3
Forge iron	564,157	2.1	408,841	1.7
Bessemer	10,986,571	40.3	9,126,843	38.6
Bess. malleable	843,123	3.1	612,533	2.6
Low phosphorus	259,071	0.9	282,460	1.2
Basic	9,084,608	33.3	8,520,020	36.0
Spiegeleisen	153,055	0.6	110,236	0.5
Ferromanganese	71.376	0.2	74.482	0.3
Miscellaneous	81,159	0.3	45,192	0.2
Total	27,303,567	100.0	23,649,547	100.0

Miscellaneous includes mottled and white pig, direct castings and some ferroalloys. Low-phosphorus pig contains less than 0.04% phosphorus; bessemer pig from 0.04 to 0.10%; iron containing 7% or over in silicon is classed as ferrosilicon. Spiegeleisen contains 9 to 22% manganese and ferromanganese 45 to 82%, the standards being 20 and 80%, respectively.

The consumption of iron ore and other materials and of limestone and dolomite flux by the blast furnaces, with the average quantities used per ton of pig iron made, are reported as follows for two years past; figures being in long tons:

	1910 Total	1910 Per ton pig.	1911 Total	1911 Per ton pig.
Iron ore	51,739,000	1.894	13,950,000	1.859
Cinder, etc.	2,800,000	0.103	2,535,000	0.159
Total	54,539,000	1.997	40,515,000	2.018
Limestone	27,303,567	1,191.8lb.	23,649,547	1,144.8lb

The miscellaneous material used in the furnaces includes mill cinder, scale, scrap, slag, zinc residuum and pyrites residues. The averages are calculated on the total make of pig iron. The miscellaneous material was 5.1% of the total in 1910 and 7.9% in 1911. In 1911 the average consumption of flux was 1153.6 lb. per ton of pig made by the anthracite and coke furnaces, and 405.4 lb. by the charcoal furnaces.

The quantity of ferrophosphorus—included in miscellaneous in the table—in 1911 was 6820 tons, an increase of 3349 tons over the previous year.

The number of completed blast furnaces in the United States at the close of the year was 466, eight new furnaces having been built during the year and 20 abandoned; a net decrease of 12 stacks. But the aggregate yearly capacity of the 20 abandoned furnaces was 404,700 tons of pig iron, while that of the eight new stacks was 1,152,500 tons, so that there was a net increase of 747,800 tons in capacity. This statement does not include 15 stacks which were under construction, but not finished at the end of the year. These will have a total yearly capacity of 1,744,500 tons of pig iron.

Industrial Accident Insurance

The Scullin-Gallagher Iron & Steel Co., St. Louis, has developed an accident-insurance system for its employees, which possesses some interesting features, says *Iron Trade Review*, July 4, 1912. Each employee pays 1% of his wages for accident insurance. That is, a man receiving $100 per month pays $1 per month to the company for the protection; one receiving $50 a month pays 50c., etc. In return for this the employee is given full medical attention by the company's surgeon without cost in case of any accident. For loss of life the heirs of the employee are paid a full year's salary in cash, this not to exceed $2600. For the loss of both hands or both feet or one hand and one foot, or for the total loss of sight, a similar amount is paid. For the loss of one hand or one foot, half of the foregoing indemnity applies. Similar payments are made for minor accidents. Also, in case an accident sustained by an employee disables him so that he is unable to attend to his duties for a period of more than one week, he is paid an amount equal to half of his weekly wages during the period of his disability.

Largest Electric Mine Hoist in America

In the mine of the Christopher Coal Mining Co., recently organized at Christopher, Franklin County, Ill., will be installed the largest electric mine hoist in America. The mine is to be operated entirely by electric power and about half the capacity of the plant will be required for the hoist. Power for the several operations will be generated at the mine by two 750-kw., three-phase, 60-cycle, 2300-volt Curtis turbo-generators, for which excitation will be furnished by a 15-kw., 125-volt turbo-exciter set. Above ground practically all the machinery, except the hoist, will be operated by alternating current; while all the underground equipment is to be operated by 250- to 275-volt direct current.

The hoist operates on the Ilgner system and is of the double-drum type, having 7-ft. drums designed for an effective load of 9000 lb. in a car and cage, the combined weight of which is 11,000 lb. Wire hoisting rope 1⅛-in. diameter is used. The equipment is being built to make 1000 trips from a 600-ft. depth in seven hours. The cycle arranged calls for 6-sec. acceleration, 9 sec. at full speed, 6 sec. for retardation, and 4 sec. loading and dumping, which corresponds to a maximum rope speed of 2400 ft. per minute.

A 1150-hp., 550-volt, direct-current motor drives the hoist and is direct connected to the drum shaft by a flexible coupling. This motor is designed especially for hoisting service and has large overload capacity. Power will be supplied to the motor by a flywheel motor-generator set, consisting of a 650-hp., 2300-volt induction motor; an 880-kw., 550-volt generator; a 17-kw., 125-volt exciter and a 22,600-lb. flywheel. This unit operates at 600 r.p.m. It is interesting to note that, through the Leonard method of control and the application of the flywheel, it has been possible to decrease the capacities of the hoist motor, generator and induction motor progressively contrary to usual practice.

The speed and direction of rotation of the hoist will be controlled by a controller at the operating platform, by means of which the voltage and polarity of the generator will be governed. Fluctuations of the hoisting load are smoothed out by means of the flywheel and an automatic rheostat in the circuits of the induction motor. The torque of the regulating motor varies with the line current and when this current tends to exceed a predetermined value, the torque of the regulating motor will overcome the weight of the moving parts of the rheostat, introducing resistance into the rotor circuits of the main induction motor, thereby causing the motor to slow down and allowing the flywheel to give up its energy. When the current tends to fall below the predetermined value, the weight of the moving parts of the rheostat will exceed the torque of the motor and the resistance will be cut out automatically. The weight of the moving parts of the rheostat is counterweighted for purposes of adjustment. In the control equipment are also included protective devices to guard against damage from overwinding, failure of alternating-current supply, loss of exciter voltage, loss of air pressure for the brakes, as well as extreme overloads. Both service and emergency air brakes are provided.

The hoist is to be of the Ottumwa Iron Works make, and all the electrical apparatus, including the mine locomotives, is being furnished by the General Electric Company.

Copper Production in Michigan

The following table, compiled from official reports, gives the copper production of Michigan in 1910 and 1911:

COPPER PRODUCTION IN MICHIGAN

Mines	1910	1911
Ahmeek	11,844,954	15,196,127
Allouez	4,655,702	4,780,494
Atlantic	19,018	nil
Baltic	17,549,762	15,370,449
Calumet & Hecla	72,672,469	72,861,925
Centennial	1,572,566	1,493,834
Champion	19,224,124	15,639,426
Gratiot	265,869	14,275
Franklin	966,353	820,203
Isle Royale	7,567,399	7,490,120
La Salle	633,778	280,598
Mass	1,321,885	1,326,898
Michigan	36,682	327,773
Mohawk	11,412,066	12,091,056
Osceola	19,346,566	18,388,193
Quincy	22,517,014	22,252,943
Superior	3,181,041	3,236,233
Tamarack	11,063,606	7,494,077
Trimountain	5,694,868	6,120,417
Wolverine	10,469,253	9,630,639
Victoria	1,164,564	1,303,331
Totals	223,179,539	216,119,011

Accident at German Potash Mine

According to press dispatches a serious accident occurred recently at the Jessenitz potash mine in Mecklenberg, Germany. While men were at work at the bottom of the shaft, about a half-mile underground, a rush of water was heard in the tunnels. By climbing the ladders the men were barely able to save themselves. The shaft is said to have filled to within 120 ft. of the surface. At the same time the level of a near-by lake fell more than a foot, indicating that about 480,000 cu.yd. of water had entered the mine from that source. It is said that the officials have pronounced the mine a total loss. The fact that the lake in question is connected with the River Elbe reduces the possibility of recovering the mine.

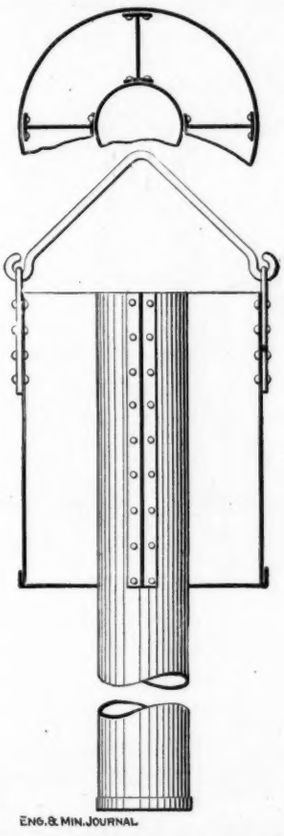
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Can for Lowering Drill Steel

BY EVANS W. BUSKETT*

In the practice of underhand stoping in the sheet-ground mines in the Joplin district, long drill bits sometimes reaching a length of 16 ft. are used. To any one who has attempted to send down drill steel in an ordinary can or bucket the accompanying sketch of a special steel can will be appreciated. This same system can readily be adapted to mines using cages.



BUCKET FOR LOWERING DRILL STEEL

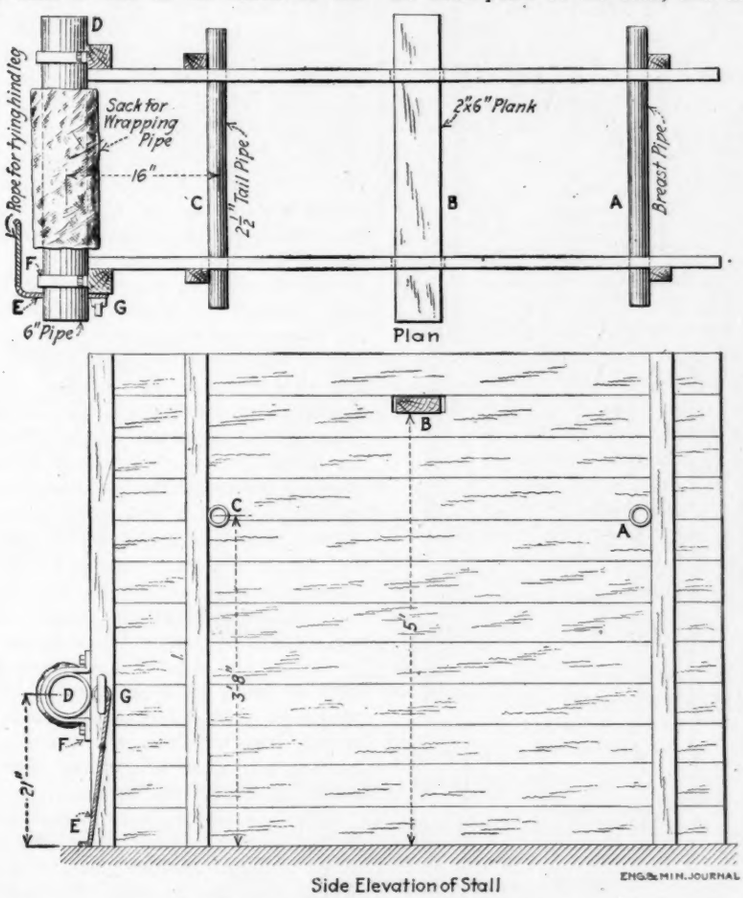
The steel can or bucket is about 24 in. in diameter and 30 in. deep. In the center is a cylinder about nine inches in diameter passing through the bottom of the can and braced at the top as shown in the sketch. This cylinder can be made to suit the length of steel used. The sketch shows a cylinder for 16-ft. drills.

In use the can is set in a hole in the platform at the collar of the shaft and the steel is placed in it. The longer steel is placed in the cylinder while the short drills are placed in the compartments made by the braces. When the can reaches the bottom of the shaft it is laid on its side and the rope detached.

*Metallurgist, Joplin, Mo.

Shoeing Mean Mules

Trouble is often experienced in shoeing mules, especially underground. In the accompanying sketch the general features of a shoeing stall are shown, which has been built at one of the shafts of the St. Louis Smelting & Refining Co., in the Flat River district of southeastern Missouri.



STALL FOR SHOEING MEAN MULES

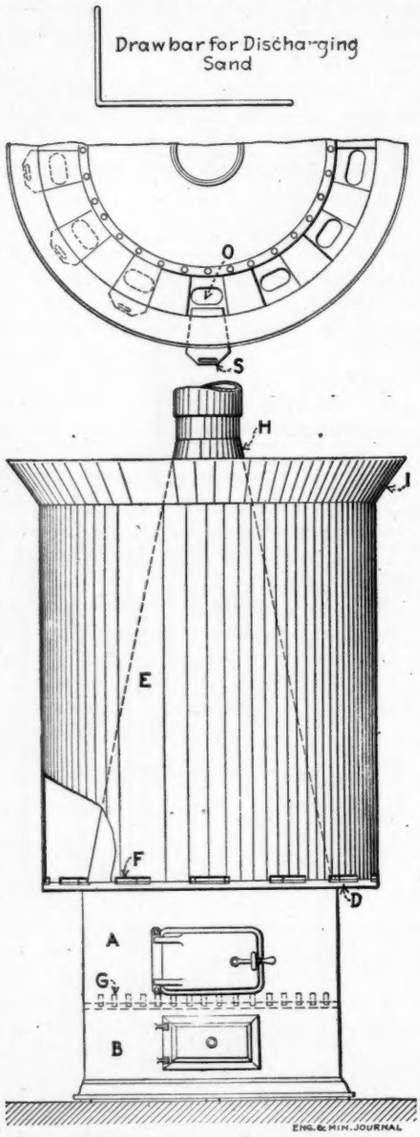
This stall is made narrow so that the mule has not much leeway. There is a pipe *A* at the manger or head end of the stall against which the breast of the mule comes. This is put in after the mule has been forced back against the other pipes and board that are used to restrain him. By this breast pipe he is kept from moving forward; by the board *B* that is put in over his back the mule is kept from rising up so as to be able to kick; by the pipe *C*, which is put in at the same height as the breast pipe, the mule is kept from backing out of the stall; and by the pipe *D*, which is wrapped with old gunny sacks to prevent the mule from injuring himself, he is prevented from kicking.

In shoeing a mule the foot that is to be shod is raised up over the pipe *D*, which is held in iron straps *F*, bolted to the back posts of the stall, and then is tied by the rope *E* that is fastened to the cleat *G*. By this rope the mule is prevented from jerking his foot back out of the shoer's grasp.

The mule can be turned around and his front feet shod in this stall if he causes trouble by not standing still or by trying to strike the man. Some mules give trouble in being shod by laying their weight on the man during the shoeing. This can be remedied by rigging up a swing and putting a band or surcingle around the mule and swinging him so as to take his weight off the shoer.

Driers for Locomotive Sand

Wherever much hauling has to be done either by air or electric locomotives in mines and the track grades are steep, a large quantity of sand has to be used, especially when in the mines there is much dripping of water from the roof. In the lead mines of southeastern Missouri, where the ore occurs irregularly through a flat dipping sedimentary formation, frequent changes in the grade of the tracks are necessary. No matter what



SAND DRIER FOR LOCOMOTIVE

the type, whether air, electric or gasoline, much sand is required for the locomotive if a heavy load is to be hauled.

Hard river sand should be used. Tailings ordinarily are too easily pulverized under the wheels. The ordinary sand driers on the market are made with many tubes, which are expensive to keep in good condition. In the driers devised for the St. Louis Smelting & Refining Co., illustrated in the accompanying sketch, no tubes are used. The drier is somewhat similar to one that was used in railroad construction work in British Columbia, but which was smaller and in which the sand drum was conical, being heated by a large upright stove, such as is used in country railroad stations. The bottom was a screen that held back the wet sand but let the dry sand trickle through. The sand drier used at the St. Louis works has a cylindrical firebox *A*, with a grate *G* and an ashpit *B*, the whole being somewhat similar to those used on some heating furnaces, except for the rim at the top which is perforated at 5-in. centers. These perforations have the shape shown in the details of the method of discharging the sand.

On the top of the firebox is the drum *E* with a notched bottom leaving opening *F*, 5-in. wide and ½-in. deep, when it is placed on top of the firebox. These openings serve to carry the slide gates *S* that slip in on top of the rim *D* and close the openings *O*, that have been cast in it, and through which sand is allowed to discharge as it dries. Inside of the drum *E* is the cone *H*, which comes down on the rim *D* of the firebox, just inside of the discharge opening *O* on a depressed ledge shown in the details of the rim and discharge opening. Between the drum *E* and the cone *H*, which is contracted sufficiently at the top to take an 8-in. stove pipe, is the space for receiving the wet sand. To aid in the charging with wet sand a rim *I* is put on the top of the drum. Owing to the conical shape of the inner faces of the sand receptacle the hot gases impinge against it and the wet sand is quickly dried. While wet the sand will not run, but as soon as it dries it is loosened enough to run down to the opening on the rim, where it is discharged. More wet sand then comes down against the inner face and is dried in a similar manner. A small poker is provided that is turned up about a foot at the end for inserting into the discharge opening and starting the sand to running if it becomes packed at the bottom.

There are no fire tubes in this heater; in fact, about the only things that have to be replaced are the grates which, of course, burn out in time. The man that tends the sand drier, for an attendant is necessary, as from two to four tons are dried per day with this device, also makes up the cartridges of tamping for the mines and does other odd jobs. This work is usually done by some crippled employee.

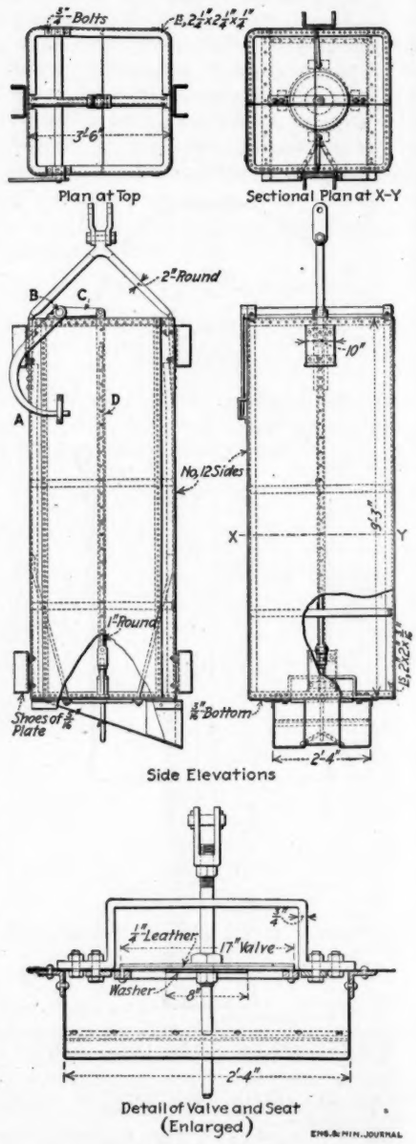
In driving the Laramie tunnel in Colorado the average depth of hole was 7½ was found that with the heavy charges used the powder formed its own tamping. It was therefore possible in case of misfires to explode the charge by pushing a new primer tightly upon the unexploded powder.

Bailer for a Winze Hoist

BY S. A. WORCESTER*

The 800-gal. bailer shown in the accompanying illustration was designed for use in the winze described in the JOURNAL of May 25, 1912, p. 1027. It is arranged to discharge into a tank placed at the south side of the winze in such a manner that two streams flow from the bottom, one on each side of the guide.

The curved arm *A* projecting beyond the upper corner of the bailer is engaged



BAILER USED IN CAMP BIRD MINE

by a stationary lug fixed at the discharge point in the winze. This lug forces the arm *A* inward, rotating the 2-in. shaft *B* and through the link *C* raises the rod *D* which lifts the discharge valve, thus emptying the bailer.

The removable guide shoes are bolted to the sides of the bailer and are fitted with liners which can readily be changed

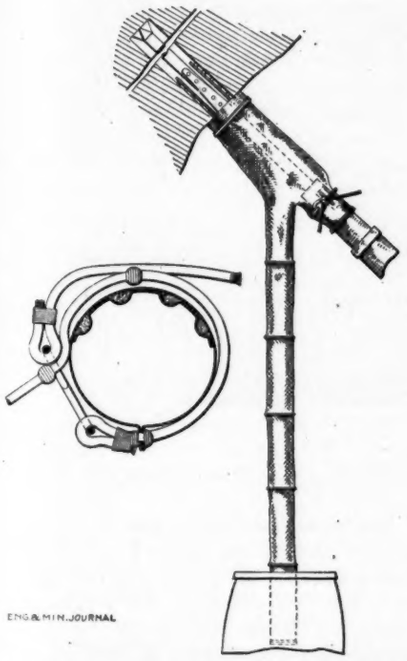
*Mechanical engineer, Victor, Colo.

in case of there being variations in the distance between guides. The sides of the bailer are made of light sheets well stiffened by ties and angles to prevent bulging. The bottom plate, $\frac{3}{16}$ in. thick, is stiffened by the angles that hold the discharge spout, by the valve-seat ring, and by the two rods from the sides.

The Mitchell Dust Catcher

The dust catcher shown in the accompanying illustration is used in the Leonard mine, at Butte, Mont., for catching dust from holes drilled above a horizontal position.

As shown in the accompanying figures the device consists of a bag made of canvas or other suitable material. The upper end of this bag is attached to a metal collar to which are riveted four projecting prongs of spring steel. The lower end of the bag is provided with means for attaching to the end of the rock drill. A canvas tube depends from the bottom side of the bag.



DUST CATCHER USED IN SOME BUTTE MINES

After the hole has been drilled into the face to a depth of six inches or more, the spring prongs are thrust into the hole far enough to bring the collar close against the face. The drill steel is then run through the bag so as to extend up into the hole. The lower end of the bag is tied tightly around the drill. As drilling progresses the dust from the hole runs down into the canvas bag thence through the tube into a suitable container.

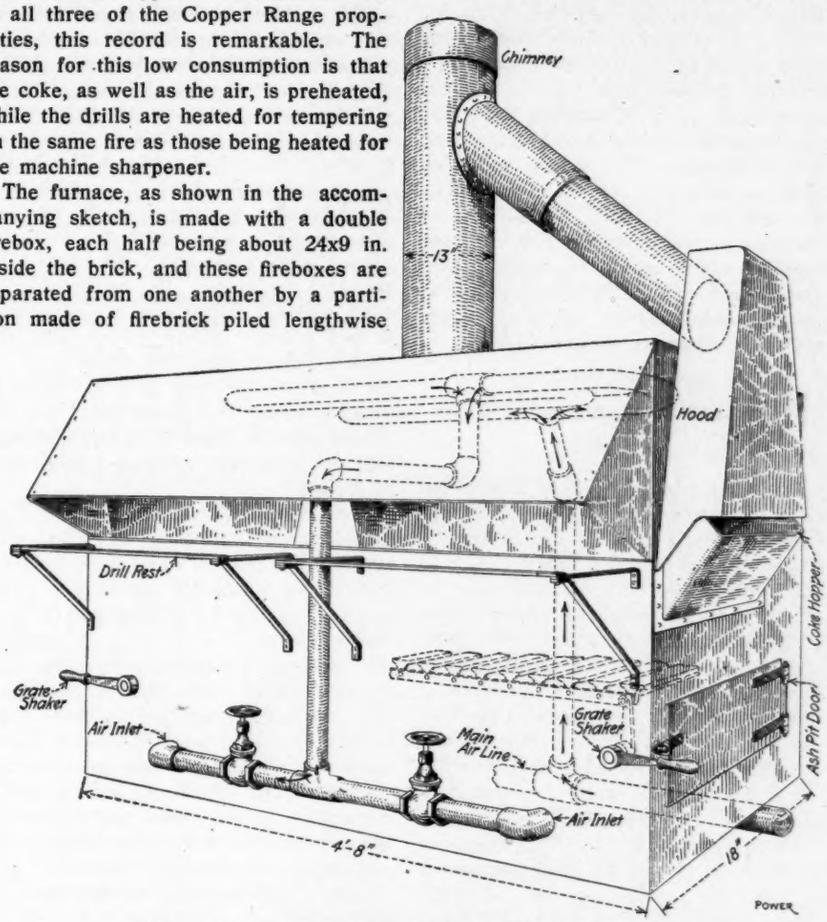
This device was designed by Thomas E. Mitchell and is patented.

Coke Furnace for Heating Drills

BY CLAUDE T. RICE

The coke furnaces used at the Champion mine, at Painesdale, Mich., for heating drills for sharpening and tempering have made the low record for coke consumption of less than half a pound of coke per drill sharpened and tempered. When considering that lots of 750,000 drills are sharpened in a year at the Champion, Trimountain and Baltic mines, for the same type of furnace is used at all three of the Copper Range properties, this record is remarkable. The reason for this low consumption is that the coke, as well as the air, is preheated, while the drills are heated for tempering on the same fire as those being heated for the machine sharpener.

The furnace, as shown in the accompanying sketch, is made with a double firebox, each half being about 24x9 in. inside the brick, and these fireboxes are separated from one another by a partition made of firebrick piled lengthwise across the wall. The firebox is 10 in. deep and fitted with a shaking grate designed somewhat on the principle of the grates in the firebox of a locomotive From time to time the grates are shaken and the clinkers broken up so that there is practically no burning out of the grate bars. The wear on the bricks of the furnace is such that the furnace only has to be relined once in two weeks, 12 firebricks being required for the purpose. This is practically the only maintenance there is on the furnace.



DRILL-HEATING FURNACE USED AT CHAMPION MINE

It will be noticed that at each end there is a hopper projecting out from the body of the furnace. These hold the coke and are kept filled so that the coke is thoroughly heated before going down on the fire. This coke feeds down as the fire needs it into the firebox, but, from time to time, the fire has to be poked, and the coke spread out. This is done through the coke hopper, a hood being used to take any gases that may come up the hopper out of the shop through the main chimney of the furnace. This hood is carried by a sleeve that goes over the main chimney pipe so that it can be made to serve the other hopper by swinging it around, there being holes cut in the main pipe to permit this being done. Generally, only one end of the furnace is used at a time, and the heating of the drills for sharpening, is done on one side, while on the other side of the fire the drills are being heated for tempering.

The path of the air through the furnace is shown in the sketch. The air comes in at the bottom, is taken up through the furnace to a coil of pipe carried on top of the arch of the furnace, so that the hot gases have to play around the coil before going out the chimney, and then comes down to the bottom of the furnace again. In this way any water that may be in the air is converted into steam and the air is preheated before going to the fire. This causes less formation of clinkers than would be the case if wet air were blown under the grate.

In order to throw the heat well out in the furnace, the firebox is made with a

low arch, having a spring of only about two inches and a width of approximately 14 in. This arch is carried upon a cast-iron frame hinged at the top so that by an expansive device it is made to grip the bricks of the arch, eight in a row set edgeways, so that they are held tightly in place; ½-in. boiler plate is used for the sides of the furnace.

Using half of the furnace, 1250 drills are often heated for sharpening and tempering in nine hours. It is because the coke is preheated and the air kept always in a dry condition that it is possible to keep the fires uniform so that the heating for tempering can be done on the same fire as the heating for sharpening.

These furnaces have been in use for some time at the Champion mine and have been found much better than the old style of furnace. They do not cost much more to make than do the others, while the operating cost and cost of maintenance are much less than with the ordinary type of coke furnace in common use. The furnace was devised by James Treganza, foreman of the blacksmith shop, and W. J. Richards, master mechanic.

High Cribbings to Support Roofs

It is often possible to mine blanket deposits by leaving part of the ore as pillars. Where the ore is low grade and the pillars may be left far enough apart so that the workings between pillars are not so small as to interfere with the breaking of the ground and the amount of cutting around pillars is not too great, this is often the most profitable way to mine such an orebody. Generally large pillars are left when going through the orebody for the first time, and later are trimmed down as small as better acquaintance with the ground indicates is feasible, doing this retreating from the boundaries. Or when it is not necessary to preserve the roof of the workings, either because the caving will not go to surface owing to the depth of the workings, or because of the surface having little or no value, these pillars are blasted out entirely, and the ore scrammed.

But it should always be remembered before deciding to allow the workings to cave that it will probably be impractical at some future time to go in after any ore that is later discovered underlying the present orebody, at least until several years have passed and the caved ground has become quiet. Failure to prospect the underlying ground or else failure to realize that improvements in mining practice would make profitable ore of what was formerly too poor to mine has tied up considerable ore in certain parts of the southwestern Missouri zinc district.

Often when going through the orebody for the first time it becomes the custom, when sufficient knowledge of the ground has been obtained, to drill the holes for cutting down the pillar as the work advances. These holes should be plugged with wood so that they can easily be found again when months afterward it comes time to load them.

Often in pillar mining, owing to a cross fissure or other unforeseen reasons, the roof between some of the pillars, although the pillars are not left far apart considering the rest of the mine workings, becomes heavy, and perchance a slab may drop out. Then it becomes desirable to build up a crib to support the roof at that place. In such a position with pillars around there cannot be much side swing in a flat, blanket deposit. Therefore the crib does not have to be large to carry a considerable weight especially if filled with rock. But in building it, especially when it is high and heavy blasting is going on in the vicinity, and especially when later ore must be blasted near-by, the small crib needs considerable steadying. In the Providence mine, where a slabby roof has developed in two places between pillars near the shafts, 7x9-ft. cribs have been built up 26 ft. high to support a roof. In each instance these have stood for a year or so and show no signs of failure although they are apparently carrying a large slab of ground.

The timbers of the crib are 7 or 9 ft. long and are 12x12-in. or 10x12-in. timbers. These timbers were overlapped six inches and outward movement was guarded against by nailing 2x6-in. and 2x4-in. planks so as to form an angle at the four outer corners where the crib timbers overlap. The main timbers were also toe-nailed together where they crossed so that outward movement of the timbers, when weight came on them and the rock filling which was carried up as the crib was built, was taken care of, while movement of the crib timbers with respect to one another was also prevented by these angle planks and the rock filling.

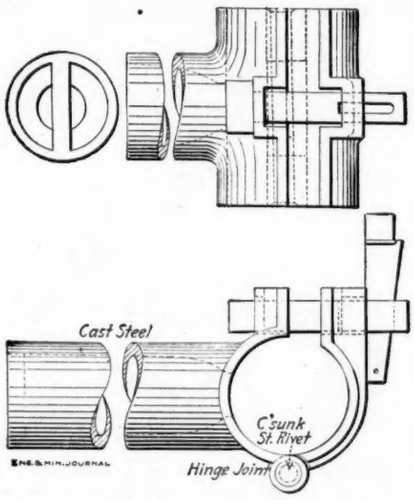
Platforms for carrying up the crib were provided by building old pieces of pipe into the filling as the cribs were carried up. Cross timbers were carried through the middle of the crib in the top two layers, and the whole outer periphery of the crib over the timbers was wedged and blocked down from the roof after the filling had been built tightly up to the roof.

In filling the crib small rock was used as there would be less voids, and the filling was built in between the timbers. The stages were put in about six feet apart vertically, and were left in for a time so that the top of the crib could be inspected to ascertain how it was taking the weight. For the first three or four days after the crib was put in the wedges were tightened each day all around the top so as to take care of any settling that might take place under the force of the concussion and the shake of the ground caused by the heavy blasting near-by, where often one or two boxes of 40% dynamite are loaded into the flat stope holes which are drilled in that mine to a depth of about 18 ft. and have a burden of 10 ft. of ground on them.

Arm for Drill Columns

By R. A. Rule*

The drill column arm generally used in underground drilling is clamped to the column by two bolts. In the arm, for which application for a patent has been made, bolts are not used. The arm is attached to the drill column by a clamp in which a wedge and slotted key are used instead of the usual bolts.



Wedge and Key Drill-column Arm

The wedge fits into a slot in the key, and by striking the wedge a smart blow with a hammer the clamp is drawn tightly about the column. To loosen the clamp the lower end of the wedge is struck with a hammer. It requires but one hand to loosen the wedge so that the other hand may be used to hold the arm when the grip is released.

In the Amur province, or on the eastern side of Lake Baikal, in Siberia, platinum-bearing gravel deposits are prospected by sinking small test pits, states Leon Perret, in a paper on gold and platinum deposits in Russia, recently read at a meeting of the Institution of Mining and Metallurgy. The prospector standing on the bottom of the pit can throw the excavated material from a depth of 14 ft., while some experts can throw from a depth of 20 to 24 ft., and with such precision, that the ejected material will fall in the proper pile at the surface. A separate pile of gravel is made for sampling for each seven inches of depth.

*Box 10, Osceola, Mich.

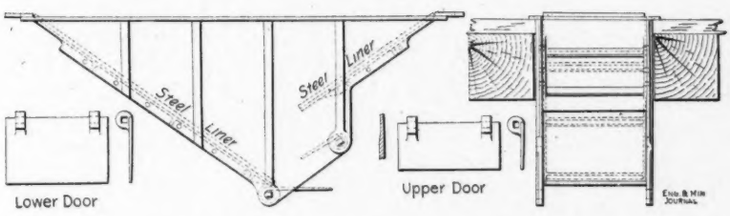
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Calumet Rock Chute

BY CLAUDE T. RICE

The type of cast-iron gate chute used on the bins at the rock-houses of the Calumet & Hecla company is shown in the accompanying illustration. The ore that goes to these bins is crushed to four inches, so no large pieces have to be handled through the chute, which is used for drawing the ore off from the bottom of the bin. Within its field of service this ore chute seems to be satisfactory, as chutes of similar design are used in the rock-houses of several of the other Lake Superior companies. Liners are used to save the bottom of the chute. These liners and the gates wear quite thin before they have to be replaced. Replacing can be done at any time easily in the case of the gates, for by closing either one of the two the ore can be held back while the other is being replaced. The bottom door or gate shuts off the ore when lifted up from below, while the other gate, which drops down, is used only to regulate the flow of ore by choking the mouth.



CAST-IRON CHUTE USED IN CALUMET & HECLA ROCK HOUSES

Levers fit on the square ends of the gate shafts, and these in the ordinary way in which the gate is used, catch on notched arms that are carried down from the bottom beams of the bin. In this way either gate can be locked shut or at intermediate points of closing so as to regulate the flow of the ore. The chutes are usually put in crossways with the railroad tracks, and then these notched braces have to be used in holding the gates in the different positions. But sometimes these chutes are put in so as to discharge lengthwise with the tracks and are opened by a system of levers that can be operated from a small house or platform on the outside of the car tunnel so that the man loading the cars does not have to go where the dust is flying and climb around on cold cars in cold weather.

Pump Suctions from Cyanide Tanks

BY H. T. DURANT*

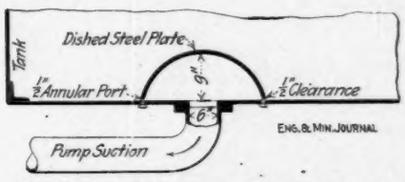
Centrifugal pumps when used to pump from tanks are usually, where possible, arranged to work fully "flooded", thereby entirely avoiding suction lift, the necessity for priming, and the use of foot valves, all of which are a source of delay when endeavoring to run full time. Sometimes the flanged suction connection is made to the bottom of the tank, and at other time to the side, as near the bottom as possible.

Unless some device is used by which the pump can practically empty the tank before it takes enough air to prevent further work, it will be found that, in the case where the suction connection is on the side of the tank, several inches of water still remain in the tank after the pump ceases to draw. Those who have had to clean out a large tank which has no other exit for mud, etc., than a pump with the suction connection on the side of the tank, will appreciate what is meant by this amount which the pump will not take.

This water represents, in a tank of any ordinarily used dimensions, such a tonnage that one is sometimes led to wonder why the suction connection was not made at the bottom of the tank, under which conditions the tank itself could have been built several inches less in depth, or, conversely, with the same depth it would have held more available water.

The accompanying sketch shows a simple and proved arrangement which causes the pump to empty the tank down to the last half inch or less. This, or some other device, may already be ancient history, although I am not aware of its having been illustrated. An obvious modification would make it equally applicable in those cases where the suction connection is to the side of the tank.

The arrangement consists of a dished steel plate of about ⅜ in. thickness, the over-all diameter of which is about four times the diameter of the suction pipe. This plate is placed inside the tank with its concave side downwards over the suction hole, and is distanced off the bottom of the tank about ½ in. by four steel wedges, or by four setscrews tapped through the dished plate.



METHOD OF ATTACHING PUMP SUCTION TO BOTTOM OF A TANK

It is essential to have the dished steel plate heavy enough, or otherwise weighted, so that, when the pump, without first closing the suction or delivery valves, is stopped, the amount of water flowing back from the delivery lines will not be able to shift the plate. This dished plate being arranged by wedges or setscrews to clear the bottom of the tank by about ½ in., will, in the case of a 6-in. pump with a plate two feet in diameter, give as feed to the pump suction an annular port about 72 in.x½ in., consequently partly compensating the friction by excessive port area.

*Metallurgist, 3 London Wall Building, London, England.

Sampling of Ore

It is not intended, by giving the following data, to enter into a discussion of the errors of sampling. These facts are given to show that it is possible for a wide range between the actual contents of the ore and the estimated contents obtained by the usual sampling methods. The factor that represents this difference is as important in estimating the costs of handling ore as any that represent costs for operation or other charges.

The results of sampling at one of the large gold mines, where the appearance of the ore gave no indication of its value and where an earnest effort was made to get an average sample of the daily production of the mine by hand sampling, were as follows: From over 24,000 samples the estimates based upon the hand sampling were 24.9% higher

than the actual contents of the ore. Another record for periods of 10 days each, which does not include any of the 24,000 samples mentioned, and probably represents over 65,000 samples, shows the following results: 19.7%, 4.47% 24.3%, 21.9%, 13.4%, 24.3%, 34%, 29% and 20.5% higher than the actual contents of the ore. These samples were all taken from cars of broken ore representing approximately a ton each, and a general sample of the whole each day checked within 2 to 5% of the separate car samples. Even with this close check the general sample would average about 20% higher than the actual contents of the ore. Numerous records covering a period of several years bear out the correctness of these figures. The records of the face samples which would compare with these records are not at hand but they were invariably higher than the mill returns would indicate after due allowance had been made for all losses in treatment.

DATA OF CONCENTRATION TEST

	1 Tons	2 Tons	3 Tons	4 Tons	5 Tons
Dry slime, head flow	1.224	1.378	2.250	1.386	2.594
Dry slime, tail flow	1.185	1.330	2.187	1.365	2.561
Concentrates by samples	0.039	0.048	0.063	0.021	0.033
Concentrates by weight	0.039	0.0475	0.0627	0.0207	0.0327

Data obtained during a concentration test where conditions were ideal for sampling also indicate the fact that some error must be counted on. The feed was a fine slime, samples were taken every 15 min. and each cut of the flow accurately timed. An average of 13 separate runs gave an extraction of 40.10% by head and tail assays. By assay of concentrates the extraction was 41.89%, a difference of 1.79%. In taking a sample of the concentrates the entire amount produced during each separate run was dried and quartered on a rubber mat. To prove the accuracy of the sampling of heads and tails the record of flow samples taken in the same manner and by the same men is given herewith.

The tonnage samples checked throughout the entire test in this way.

Overstrom Jig Eccentrics

The details of the jig eccentric designed by G. A. Overstrom, the inventor of the Overstrom classifier and of the Overstrom concentrating table, are shown in the accompanying drawings. These eccentrics are used on the large single-compartment, roughing or bull jigs in the Overstrom section of the mill of the St. Louis Smelting & Refining Co. in southeastern Missouri. The screens of these jigs are three feet wide by five feet long.

The special feature of these eccentrics is their safety, due largely to the fact that the adjusting nut for changing the throw is in the interior of the eccentric and does not stick out where it might strike an attendant while oiling or doing other work about the top of the jig. The cap screws on this eccentric project a little from the hub, but as they are turned towards the driving pulley of the shaft, are not in a position where, under ordinary circumstances, they could catch upon the garment of an attendant.

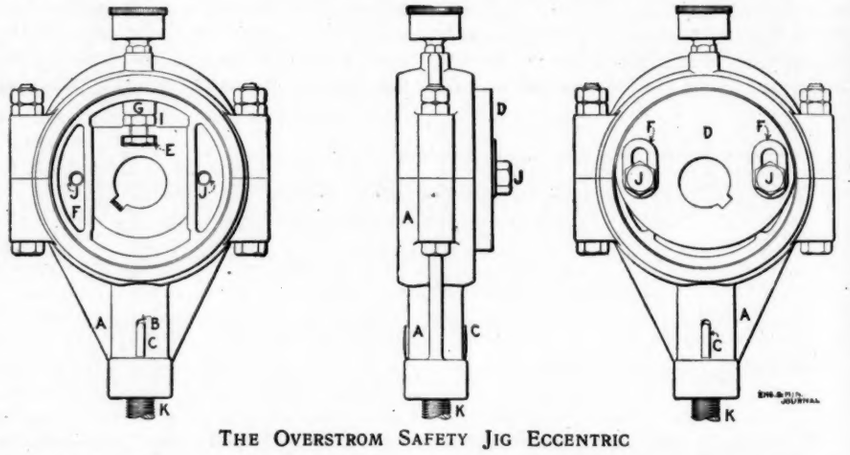
In case the eccentrics were to be used on a jig with more than one compartment, they could be made perfectly safe by casting the collar of the hub with grooves around the slots, up and down which the gripping bolts would slide as the throw of the eccentric is changed. Then the head of the cap screws would not project beyond the surface of the eccentric and there would be practically no chance for an attendant to be caught. This use of a groove to carry the head of the cap screws below the outer surface of the collar of the hub of course would necessitate the use of socket wrenches in tightening them, but that would be but a small drawback.

The idea of this eccentric, which Mr. Overstrom has improved in several important details, was obtained from the eccentrics designed by Ernst Müller and used at the old Parrot mill at Butte, Mont. There is danger from projecting nuts on the ordinary type of jig eccentric, whenever devices of variable throw are used. Not only would the improved eccentric save many men from injury, but it would permit freer working about the top of the running jig and the work could consequently be done more rapidly.

The Overstrom eccentric is made on the slip type because of the greater ease in adjusting and holding the throw and the greater convenience attending the use of such a slip-eccentric compared to one of the double-eccentric type. But there is no reason why by countersinking the heads of the adjusting nuts, a double eccentric could not be made just as safe. It would only necessitate the use of a little more metal in the castings.

The strap yoke contact with the eccentric was made flat simply because of the tools that were at hand. Where the machinery is available for making ball and socket surfaces, Mr. Overstrom makes the joint between the eccentric and the strap of that type, as there is no possibility of the plunger binding on the sides of the plunger compartment of the jig.

The eccentric yoke is attached to the plunger piston by the key *C*, that passes through the slot *B*. The hub *G*, that passes through the eccentric is made ovoid. This hub, of course, is keyed to the jig shaft. Two slots *F*, are cut through the collar of the hub where the hub proper goes inside the body *K*, of the eccentric and is fastened to it by means of the two cap screws that pass through the slots *F*. In the hub *G*, is a slot *D*, cut out to receive the adjusting nut *I*, it being recessed to grasp the head of the adjusting nut, so that the hub is held securely in position when the clamping nut is brought to bear on the upper face of the hub. The body of the eccentric is cut out in the center so that it will straddle the hub portion of the eccentric. This hub is inserted in the body, the cap screws *J*, are screwed into the body after being inserted in the slot F and then the adjusting screw *I* by the nut on it is screwed out so as to enter the boss *G*, on the body of the eccentric. The adjusting screw *I*, is screwed into the body until the desired eccentricity is obtained. Then the locking nut is screwed home on the hub and the body locked securely into position with respect to the hub. Next the cap screws are tightened to grip the hub and the body together, and the eccentric is set rigidly to give the stroke to the plunger that is desired.



THE OVERSTROM SAFETY JIG ECCENTRIC

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Classification of Bitumens

The following classification of bitumens was worked out by David T. Day in conjunction with the German Society for Testing Materials and Professor Marcusson:

NATURAL BITUMENS

I. Saponifiable (principally wax fats):
Sapropel wax.
Algæ wax.
Lignite bitumen (raw crude mountain wax).

These waxes, on account of geological considerations as to the origin of bitumens, are to be regarded as the earlier stage in the process of formation of the materials mentioned under the following heading.

II. Not saponifiable (principally hydrocarbons; also lignite and solid bitumens, oxidized and sulphureted hydrocarbons).
Solid or sulphureted and oxidized hydrocarbons, natural asphalt, natural tar, etc., the first containing from 2 to 12% sulphur. (a) Natural gas. (b) Petroleum, liquid and semisolid. Distillates, oils, petroleum benzine (boiling up to 150° C.) Illuminating oils, gas oils, lubricating oils, petroleum paraffin, liquid mineral oils, and semiliquid tar, harder petroleum tar and petroleum coke. (c) Natural wax (ozokerite). By refining processes yields ceresin, or by distillation paraffin wax and oil.

For an elaborate classification of the bitumens, giving their physical and chemical characteristics, see the JOURNAL of Dec. 30, 1911.

Aluminum for Electric Conductors

The advantages of aluminum for electric conductors have been discussed several times. The specific gravities of aluminum and copper are about 2.71 and 8.95, and their conductivities about 61:100, so that only one-half the weight of the copper conductor is required in the aluminum wire. In the United States, however, owing to the duty on aluminum, 7c. per lb., the theoretical saving of aluminum over copper is only about 10%. In Europe and Canada, with low-pressure currents, the saving is about 36%. However, the *Electrical World*, July 6, 1912, calls attention to the fact that in high-pressure lines, the cost of the insulators and towers is so great as to make variations in the cost of the conductor a much smaller factor. The towers are spaced far apart, and their extra height to allow for the greater sag in the lines, and their greater width to take care of the swing of this sag in a wind storm, cuts down the saving to about 4 to 6%. However, corona losses are much less with the larger aluminum conductors.

Locomotive Haulage in Mines

According to *Echo des Mines*, June 24, the costs of haulage in German mines under varying conditions are as follows, amortization charges being included except in the last item: Gasoline locomotives, 4.51c. per ton-mile; continuous current electric-trolley locomotives, 3.95; monophase trolley locomotives, 2.96; storage-battery, 4.79; compressed-air, 3.95c. per ton-mile.

In summing up, the trolley or compressed-air locomotives are said to be particularly indicated in large galleries, the benzine or storage-battery locomotives where the galleries are low or tortuous.

M. de Valbreuze stated that his opinion was that the great field of usefulness is reserved for the trolley locomotive using high-tension currents, i. e., when an underground installation at 2500 to 3000 volts can be perfectly protected, and that this problem appears to him by no means insoluble.

Drying Air for Blast Furnaces

A method proposed by Bruce Walter (*Proc.* Eng. Soc. Western Penn., May, 1912) for drying air for blast-furnace use is to pass the air through screens over which water runs which enters the apparatus at 34° F. and leaves it at about 39°. This reduces the humidity (neglecting entrained vapor) to about 2.75 grains per cu.ft. The air is then run over brine screens, the brine entering the apparatus at temperatures below freezing. The advantages of the method are that no energy is expended freezing moisture in the air, and no time lost defrosting the apparatus.

Selenium Glass

The production of about 11,000 lb. of selenium per annum by the American copper refineries is mainly used in the production of red glass and red-enameled ware (*Journ. Ind. Eng. Chem.*, July, 1912, abstr. from *Sprechsaal*, Nos. 14 and 15, 1912). The dioxide does not give any color, but by reducing the selenium dioxide by arsenic trioxide, by carbon, or by fusion in a reducing atmosphere, the red color is obtained. This, however, is apparently not due to metallic selenium, but to selenides, for when the glass is dissolved in hydrofluosilicic acid, hydrogen selenide is evolved. In general it appears that soda-lime mixes are unsuitable for producing selenium red glass, as are also zinc, boric-acid, phosphoric-acid, stannic-oxide, or calcium-fluoride glasses. This means that the glass must be a potash glass, and preferably highly acid. A good mix was found to be that of Bohemian glass, 1.49 K_2O : CaO : 9.8 SiO_2.

[The statement is made in the original that the production of 11,000 lb. is made by three firms. As there are five firms producing from time to time, the above production estimate is probably under the proper figure.—EDITOR.]

Thermochemistry of Silicates

The heats of formation of various silicates from the metallic oxides and silica have been determined by measuring the heat of solution, in hydrofluoric acid, of the oxides and silica concerned. The results obtained are shown in the accompanying table (*Zeits. anorg. Chem.*, p. 198, 1912; abstr. in *Journ.* Soc. Chem. Ind., June 15, 1912), although the heats of formation of the aluminum silicates are approximate only.

	Cals. per gram-molecule	
	Heat of Formation	Heat of Crystallization
Sodium silicate	+ 97.85	.....
Manganese metasilicate	.....	+ 8.52
Zinc orthosilicate	— 23.74	+ 9.04
Zinc metasilicate	+ 2.49	.....
Leucite	+101.6	.....
Microcline	+104.2	.....
Adularia	+131.2	+55.72
Analcite	+ 85.22	.....
Natrolite	+ 95.76	.....
Heulandite	+ 59.44	.....

Capacity of Filter Presses

The laws of the flow of liquids in filter cakes have been investigated by C. Almy, Jr., and W. K. Lewis (*Journ. Ind. and Eng. Chem.*, July, 1912), who find them capable of mathematical expression thus:

$$R = K\frac{P^m}{V^n}$$

where R is rate of flow in c.c. per min., P is the pressure, V the volume of the filtrate in c.c., and K, m and n are constants readily determinable by experiment. In the author's experiments, using a chromium-hydrate sludge, a 6-in. cor-

ner feed press, and 100, 75, 50, 25, 10 and 5 lb. pressures K was found equal to about 13,600, m to 0.270 and n took various values from 0.62 to 0.81, depending on the filtrate. These values will at least serve to give some idea of the magnitude of the constants.

Oil Engines

The committee on prime movers of the National Electric Light Association has recently presented some data on the various types of oil engines, which have been summarized by *Power*. The oil engine differs from the more familiar gas engine only in that the fuel must be prepared for combustion at the engine, or injected at high pressures, and therefore either a carburetor, vaporizer or an injection valve must be provided for vaporizing the liquid-oil fuel, depending upon whether low-, high- or modified-compression type of engines are used. The simple automobile engine comes within the former class (low-pressure). For power purposes the low-pressure engine frequently employs a hot-bulb or "preheating chamber," to enable the engine to burn comparatively low-grade oils. The Diesel engine employs high-combustion pressures (500 lb., approximately) and requires an air-injection pressure of about 1000 lb. It has a cycle peculiar to itself, and the distinguishing feature is that the fuel is injected at constant pressure for about 10% of the working stroke, while the air is hot enough by reason of the high compression to cause combustion on contact.

The guarantees usually given have been about as follows: Diesel, oil consumption not to exceed 0.5 lb. of oil per horsepower-hour; De La Vergne, not to exceed 0.6 lb. per horsepower-hour; Hornsby-Akroyd, not over 1 lb. per horsepower-hour. Oil not to contain under 18,500 B.t.u. per pound. While in fuel economy, the Diesel is superior, reguarding maintenance and attendance, the low-pressure type has much in its favor. This would lead to the opinion that for the larger sizes, exceeding 150 hp., the Diesel motor should be chosen, while in case of small power requirements (under 100 hp.) the low-pressure type would generally be used. In the neighborhood of 100 to 150 hp. the field will be disputed between the two according to existing fuel prices and local conditions. There has been developed a design which may be termed a "compromise" between the low-pressure hot-bulb and the Diesel high-compression engines, for which there is claimed a fuel economy comparative with the Diesel motors, although it employs lower working pressures.

Slagging Type of Gas Producer

The U. S. Bureau of Mines is continuing experiments with the slagging type of gas producer for the utilization of low-grade fuels, and reports encouraging results (Bureau of Mines, *Technical Paper* No. 20). Intermittent runs are not satisfactory, as the slagged ash solidifies in the bottom of the producer, and it is hard to start again on cold air. With preheated blast a four-day intermittent run was made.

On a continuous run of 76 hours, the gas was uniform in value, and good in quality, averaging about 31% CO, and less than 1½ CO_2. Slag was tapped about every hour. About 20 lb. of coke per square foot of producer area was burned per hour, and 15 lb. of limestone was used per 100 lb. of coke. Blast heated to about 440° F. was used, but no steam. However, in other tests 0.75 lb. of steam per pound of fuel was used, with no appreciable effect upon the slagging of the ash.

Dredging in the Seward Peninsula, 1911

The accompanying table was compiled by the U. S. Geological Survey (*Bull.* 520-M), to show the dredges operating on the Seward Peninsula in 1911. It is estimated that from 2,000,000 to 2,800,000 cu.yd. were handled in 1911 by these machines, and that the production was $1,400,000. The entire gold production of the peninsula was $3,100,000, a decrease of about $400,000 from 1910, largely due to a falling off in the winter production, which was about $1,000,000 in the winter of 1909-1910, and dropped to about $200,000 in the winter of 1910-1911. No important new strikes were recorded. An attempt was made to boom the placers in the extreme eastern part of the peninsula, in the Koyuk basin, but the Survey thinks it is good only for one-man camps and dredging.

DREDGES IN OPERATION ON SEWARD PENINSULA IN 1911

Company	Region	Creek	Built	Type of builder	Size of buckets (cu.ft.)	Bucket line	Source of power	Fuel used per day	Remarks
Gold Beach Dredging	Nome	Osborn	1905	I. B. Hammond	5	Open	Crude oil	18 bbl.	
Nome Con. Dredging	Nome	Bourbon	1908	E. L. Smith-Lidgerwood	9	Close	Electricity	(?)	Power generated from oil.
Nome Con. Dredging	Nome	Wonder	1908	E. L. Smith-Lidgerwood	7	Close	Electricity	(?)	Power generated from oil.
Plein Mining & Dredging	Nome	Otter	1910	Risdon	3½	Open	Crude oil	13 bbl.	
Saunders Dredging	Nome	Saunders	1910	(?)	3½	Close	Distillate	200 gal.	
Arctic Gold Dredging	Nome	Saunders	1910	Union Iron Works	2½	Open	Distillate	160 gal.	
Sioux-Alaska Mining	Nome	Moss	1910	Union Iron Works	2½	Open	Distillate	160 gal.	
Julien Dredging	Nome	Osborn	1911	Union Construction Co.	2½	Open	Distillate	190 gal.	
Nome Con. Dredging	Nome	Wonder			10		Electricity		Still under construction.
Seward Dredging	Solomon	Solomon	1905	Bucyrus	5	Close	Coal	12-15 tons	Formerly the Three Friends.
Sievertsen	Solomon	Solomon		(?)	(?) 1	Open	Distillate	(?)	Built before 1906.
Mulligan	Solomon	West		(?)	(?) 1		Distillate	(?)	Built before 1906; runs on track.
Nome - Montana & New Mexico	Solomon	Solomon	1908	Risdon	5	Open	Coal	5 tons	Previously at Hope, Alaska.
Solomon Dredging	Solomon	Solomon	1910	Bucyrus	3½	Close	Coal	7 tons	
Flodin Mining & Dredging	Solomon	Big Hurrah	1910	Risdon	2½	Open	Coal	3 tons	
Sievertsen & Johnson	Solomon	Solomon	1910	Risdon	2½	Open	Coal	3 tons	
Kimball	Solomon	Shovel	1911	Sluice-box type	2½	Open	Distillate	150 gal.	Similar to Kimball-Saupe dredge on Melsing Creek
Blue Goose Mining	Council	Ophir		I. B. Hammond	5	Open	Wood	12 cords	Built before 1905.
Alaska Gold Dredging	Council	Warm	1909	Byron Jackson	2½	Open	Distillate	160 gal.	
Alaska Gold Dredging	Council	Goldbottom	1909	Byron Jackson	2½	Open	Distillate	160 gal.	
Wild Goose Mining & Trading	Council	Ophir	1910	Yuba Construction Co.	3½	Close	Distillate	300 gal.	
Goose Creek Dredge	Council	Goose	1910						Not in operation.
Alaska Gold Dredging	Council	Willow	1910	Union Iron Works	2½	Open	Distillate	160 gal.	
Kimball & Saupe	Council	Melsing	1910	Empire Iron Works	2½	Open	Distillate	150 gal.	Sluice-box type.
Lubbe	Council	Mystery	1911	Union Iron Works	2½	Open	Distillate	150 gal.	
York Dredging	Port Clarence	Buck	1911	Union Construction Co.	2½	Open	Distillate	190 gal.	
Cripple River Dredging	Southwest Seward Peninsula	Cripple		E. L. Smith-Lidgerwood	(?) 5	(?)	Distillate	(?)	Reported under construction.
Kelliher	Kougarok	Taylor		Union Iron Works	2¾	(?)	Distillate	(?)	To be hauled to Taylor Creek during winter of 1911—12.

Treating Clayey Gold Ore

The difficulty of extracting gold from clayey ores is known. According to *Echo des Mines*, Mar. 7, 1912, a recently devised process to treat such ores consists in drying, and then baking such ores to vitrification. They are then stamped or crushed and the gold recovered as usual.

West End Consolidated Mill, Tonopah

By J. P. Hart
and H. L. Williams*

This 100-ton mill was remodeled last year into an all-sliming, non concentrating plant to treat lower grade silver ores. The ore from the 20-stamp battery is slimed by tube mills in closed circuit with Dorr classifiers. The slime is dewatered in Dorr thickeners and given a 60-hr. agitation in Trent agitators after which it is further thickened and treated in a 100-leaf vacuum filter. The zinc-box precipitate is melted in an oil-fired Faber du Faur furnace. An extraction of 90.4% is obtained on $17 ore at a cost of $3.52 per ton.

*Care of West End Consolidated Mining Co., Tonopah, Nev.

The mill of the West End Consolidated Mining Co. at Tonopah, Nev., is a 20-stamp, all-sliming, nonconcentrating mill, designed to treat the lower-grade, characteristic silver ore of the district. Construction was started in April, 1911, and milling operations were commenced in September.

Ore Conveyed to Mill by Auto Truck

The ore from the mine is passed through a Crane ore washer, described in the ENGINEERING AND MINING JOURNAL, Oct. 14, 1911, and the picked product is loaded from chutes and hauled to the mill railroad bins, a distance of 2000 ft., in a Pierce Arrow auto truck. The truck is provided with a tilting bed having an eye-bolt at the center of the front end, by which it is attached to an overhead 12x48-in. air lift, thus effecting a simple and rapid method of unloading into the crusher bins beneath the car track. The truck has a capacity of 5 tons per load and averages 3½ to 4 loads per hour.

From the bins the ore is passed through a 10x20-in. Blake crusher, elevated to a 32-in. by 6-ft. trommel with 1-in. apertures, the undersize dropping directly to a 14-in. belt conveyor having an inclination of 18½°. The oversize, after passing through a No. 3 Kennedy gyratory crusher, fitted with short head and concaves, joins the undersize from the trommel, all passing a 1¼-in. ring, and is conveyed to the battery bins. The crushing plant handles from 20 to 25 tons of ore per hour. The capacity of the mill is from 100 to 110 tons per day.

The battery bins are made of reinforced concrete with solid concrete ends, and have a capacity of 200 tons. The batteries consist of four units of five stamps each, driven from a common countershaft by friction-clutch pulleys. The battery frames are of steel, originally of the cantilever type, but vertical 12-in. steel I-beams have been placed as posts at the end of each cantilever to take up the vibration. Ten stamps are of 1200 lb. weight each, while the remaining ten weigh 1300 lb. each.

Favor Square-mesh Screens

Both "Ton-Cap" and square-mesh screens have been used on the batteries, but the latter have gained favor from the fact that the "Ton-Cap" screens seem more subject to choking up. Little or no trouble is experienced on this point with the square-mesh screens. It is probable that the coarse-gage wire used in the "Ton-Cap" screens is partially the cause of this trouble. The batteries are equipped with screens of different meshes varying from 6 to 12, the object being to give the tube mills a feed of different grades, as this method gives better results in sliming. The stamps make 101 drops per minute through 6½-in. chrome-steel shoes are used, while the dies are cast iron made by the Tonopah foundry.

Two Dorr duplex classifiers making 12 strokes per minute, follow the stamps. The overflow discharge, of which 90% is finer than 200 mesh, passes to four 16x10-ft. Dorr thickeners. The sand is fed to two 5x18-ft. tube mills. The classifiers are placed end to end, parallel to and on the next floor below the batteries; the distance between center lines of the batteries and classifiers is 18 feet.

The tube mills are also placed end to end, a feed and discharge end adjacent, making batteries, classifiers and tube mills parallel to each other. This is a convenient arrangement and requires but a minimum of space. The distance between the batteries and the tube mills is only 25 ft. and all machinery included in stamping, classifying and tube milling is within the vision of the battery man, who, on account of the compactness of the arrangement finds little trouble in tending to these three stages.

Another feature of the end-to-end arrangement is that it permits the driving of both mills from a common pinion shaft, this pinion shaft being connected to each pinion by a 33-in. cut-off friction clutch and driven from its center by a 120-hp. Morse silent-chain drive and 100-hp. Bullock motor. This arrangement of two mills on a common pinion shaft gives a compact drive and allows the use of a motor closely rated to the running horsepower of the two mills; as, with the two clutches, the motor is capable of starting both mills with only a small overload, and of running either independent of the other.

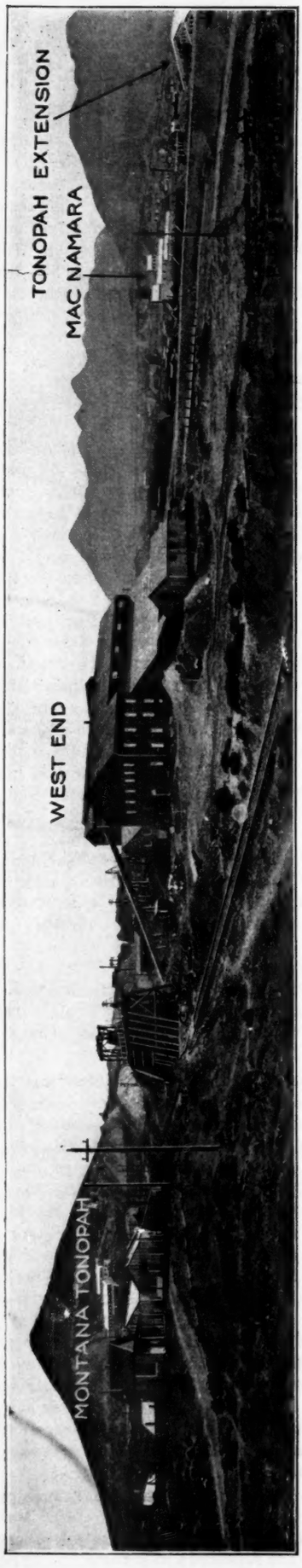
Tube Mills Have Chain Drive

As this was the first attempt in cyanide practice to drive tube mills with a chain, a little detail may be of interest. The advantages claimed for the chain drive over the ordinary belt drives are compactness and saving of power. The power lost due to belt slippage is 6 to 8%, which would be about double in the case of a countershaft with two belt drives. This heavy loss in power is overcome by the use of the direct chain drive, which has a loss of but 2 per cent.

When the mill first started, the rapidity with which the rocker pins broke became alarming. Advices from the manufacturer, however, were to the effect that failure of some of the more highly tempered links and pins was to be expected at the start, as a few links that might not be absolutely accurately bored would be thus receiving the bulk of the strain, after which little trouble would come from this cause. There are at present about 30 broken links in the chain, most of these having failed in the first two weeks' run. As the chain contains 3450 links, the number of links broken throughout the chain has but a slight effect on its usefulness. Four of the rocker pins broke in the first few days while the chain was being tried out on the empty mills, but none have broken since. After 7 months' service the chain has proven itself most satisfactory and has gained preference over the belt drive among all concerned in its operation. One 100-hp. motor furnishes the power for the two mills and also for the bucket elevator which returns the tube-mill discharge to the classifiers. Power readings showed a consumption of exactly 100 hp. The tube mills make 26 revolutions per minute.

Smooth cast-iron chilled liners, cast at the local foundry, are in use. Liners 2 in. thick lasted over seven months, the liners near the discharge end still being good for longer service. The new liners are 2½ in. at the first third, 2¼ in. at the second third, and 2 in. at the last third of the shell, and should last more than eight months. This type of liner has succeeded all other types of liners in the mills in Tonopah. When compared with the Brown or El Oro type of liner it has proved a better slimer; compared with the other type of smooth liner, silex blocks, it gives a longer life and can be more quickly renewed. With this type of liner, the mill can be relined and running in 16 hr. The pebble consumption is 4.8 lb. per ton of ore treated.

From the classifiers the overflow slime flows by gravity to four 16x10-ft. Dorr continuous thickeners. These thickeners make one revolution in six minutes. The



SOME MILLS OF THE TONOPAH DISTRICT. THE WEST END IS A 100-TON, NONCONCENTRATING, ALL-SLIMING MILL

four thickeners handle 110 tons of ore and 1000 tons of solution daily, the pulp being thickened to a specific gravity of 1.28 to 1.30. With the solution titrating 1 lb. CaO per ton of solution, or with the addition of 3 lb. CaO per ton of ore, a perfectly clear overflow is obtained. This overflow solution is sent to either the battery sump tank or the silver tank, as desired. The settling capacity of the thickeners is found to be as high as one ton of slime for 6 sq.ft. of settling area; the slime is a granular one containing little flocculent material, 90% of it passing a 200-mesh screen.

From the Dorr thickeners the pulp is drawn to four Trent underfed agitators by means of four No. 3 Gould diaphragm pumps. These are the first of this type of pump to be used in this district and are proving highly satisfactory. Each of the pumps is driven by an adjustable eccentric and eccentric rod from a common shaft 4 ft. above. The speed of the pumps may be varied by three-step cone pulleys, giving 11, 19 or 26 strokes per minute. By varying the stroke between 0 and 3 in., the pulp may be drawn from the thickeners as rapidly as desired.

As these pumps are necessarily suction pumps, they are placed high enough to allow the pulp to flow by gravity into one of the four agitators. This makes the height of suction 20 ft., but as the suction is connected directly to the thickeners the height of suction is decreased nearly 10 ft., the height of the thickeners. This makes the lift about 10 ft. However, the pumps can empty the thickeners if desirable.

The pulp as pumped usually has a specific gravity of 1.26 or approximately two of solution to one of slime. With the pumps set for a 1¾-in. stroke, the four will pump 3.2 tons of dry slime per hour on slow speed, 5 tons per hour on middle speed and 7.4 tons per hour on high speed. When greater than a 2-in stroke is used the wear and tear on the rubber diaphragms is excessive, especially when high speed is used. The only part of the pump requiring renewal is the rubber diaphragm, which has an average life of two months and costs only $1.80. Their reliability, range of adjustment, and little attention needed are strong points in their favor.

TRENT AGITATORS USED

From the diaphragm pumps the pulp flows by gravity through launders to each in turn of four Trent underfeed agitators. Thus each agitator serves as a collector until it has received its full charge. The tanks 24x18 ft. in size, take a charge of about 80 tons of dry slime, and 190 tons of solution each. A 4-in. centrifugal pump is used to run the agitator. The pump discharges through fifteen ¾-in. nozzles, making the area of discharge 6.6 sq.in. as compared to 12.6 sq.in. area of suction.

It has been stated in a description of the Tonopah Extension mill that, with a Trent agitator, the pump works only against a balanced head, that is, the head is the same on both suction and discharge, and for this reason little power is required. This is misleading, as it is evident from the construction of the agitator, that sufficient velocity must be given the pulp issuing from the nozzles to cause enough back pressure to revolve the arms. By actual test this pressure, as measured on the pump discharge, is found to be from 14 to 16 lb. per sq.in., depending on the condition of the runner. The head against which the pump works is, then, really 37 ft. With a back pressure of 16 lb., the agitator revolves at the rate of 3½ revolutions per minute and takes 9 hp. When the speed of one of the agitators was cut down by a broken runner to only one revolution per minute, the back pressure was found to be only 13 lb. per sq.in. and the horsepower used only two or three. This is hardly sufficient for good work, and not enough to start again after an hour's shutdown.

The centrifugal pump is connected to the tank by 6-in. suction and discharge pipes. There are two suctions, one near the bottom of the tank and one near the top. When a tank is full, the bottom suction is closed and the pulp is drawn from the top of the tank. For aëration air is supplied at the pump discharge under a pressure of 20 lb. per square inch.

SPECIAL CENTRIFUGAL PUMPS

The pumps are of a pattern made by Campbell & Kelly, of the local foundry and machine shop. All the centrifugal pumps in the mill are of this type, as they are the result of a long study of centrifugal pumps in mill work and have supplanted pumps of many other makes in this district. They have the following good points: The bearings are separate, babbitted, cast-iron cylinders that can be slipped into place and exact alignment in a few minutes. The thrust of the runner is taken up by a pressed-steel ball race, running in oil, on the end bearing. A nut and lock nut beyond the ball race allows the runner to be slacked off to the suction to maintain efficiency. The runner is of the open-vane type and runs in a hard cast-iron liner within the shell, the liner being fitted with a ground joint to prevent leakage. These agitator pumps ran continuously for six months at a speed of 500 r.p.m. without requiring a repair part of any kind and maintaining the same speed on the agitator. At the end of seven months the shells and runners are still good for two months with the renewal of but one broken runner. A recent cut in speed to 460 r.p.m., reduced the speed of the agitator to 2 r.p.m. with a consumption of 4 to 5 horsepower.

Pulp Thickened before Filtration

After a 60-hr. agitation, the agitator charge is transferred to a 28x22-ft. Dorr thickener by a 6-in. Campbell & Kelly centrifugal pump. The thickened pulp of from 1.30 to 1.40 specific gravity is slowly drawn to a small stock tank, 28x8 ft., or to the filter as desired. This small stock tank will hold enough thickened pulp to fill the filter box when commencing a charge and also serves as a tank to which the stock can be returned after caking. It is fitted with a gear-driven arm agitator which revolves at the rate of 5 r.p.m. and takes 2.1 hp. to operate.

By this means the pulp in the thickener remains undisturbed, allowing from 90 to 120 tons of solution per day to be decanted to the silver tank without being filtered. A cake can be formed much more rapidly with the 1.40 specific gravity pulp than with the ordinary agitator pulp. The thickener revolves once in 6 minutes and requires less than one horse power. This system of a large thickener and a small agitator requiring 3 hp. as a total to operate, and holding three filter charges is an advantageous unit of large size and small power consumption.

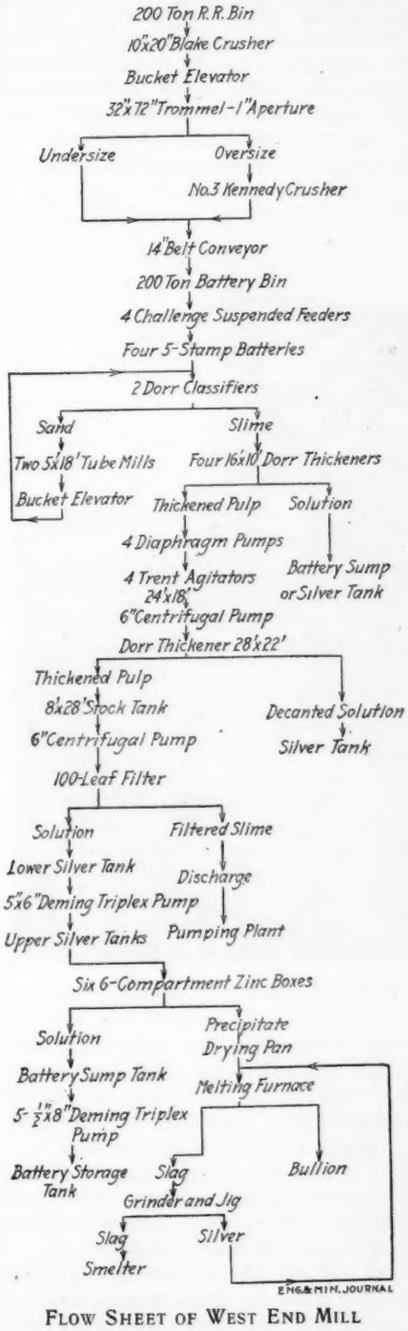
The 100-leaf vacuum filter is operated by a 6-in. Campbell & Kelly centrifugal pump running at 520 r.p.m., a 5¼x8-in. Connersville two-lobe cycloidal vacuum pump running at 550 r.p.m., and a 5x6-Deming triplex pump running at 66 r.p.m. for handling the silver solution.

Low-cost Vacuum Pump

The advantage of a Connersville cycloidal vacuum pump lies in its low first cost, small size, small power consumption and few repair parts. The pump has a 2½-in. suction and discharge, a 46¼x19-in. base and stands only 21¼ in. high. The net cost was $175. During the seven months this mill has been in operation, the pump has been repacked but once, while the parts show little or no wear. The power consumption is approximately 3 to 4 hp. and its maximum vacuum on 100 leaves at this altitude of 6000 ft. is about 19 in. A 1½-in. cake can be formed from a 1.40 specific gravity pulp in from 45 to 60 minutes. With the vacuum on for such a short time a spongy, porous cake is formed, making it an easy matter to replace the pregnant solution in the cake.

While caking the pulp is kept in suspension by means of an air lift, which elevates the pulp from the bottom of each of the five hoppers. An air pressure of about 20 lb. is used. A 3-hour solution wash is given the 1½-in. cake. About 80 tons of solution passes through the leaves in this time, making about five displacements of the 15 tons of silver solution originally contained in the cake. This long solution wash was given an additional extraction of from 1 to 2 per cent.

Five leaves per day are treated in from 0.5 to 1% muriatic acid. A special mechanism, patterned after one used at the Belmont mill, was devised for giving the leaves a thorough acid treatment. This device was described in the Engineering and Mining Journal, Mar. 30, 1912, but was not credited to the Tonopah-Belmont mill at which place it originated. By the use of this apparatus a vigorous circulation of acid is maintained through the canvas, accomplishing more with a weak solution than by soaking in a stronger acid. The life of the leaves should be materially increased by use of the weaker acid also.



Flow Sheet of West End Mill

Zinc-shavings Precipitation

The solutions are precipitated by zinc thread in six redwood boxes of a special design, each of six compartments 30x30-in. cross-section and 24 in. deep, with a hopper below the screen. In cleaning up, the precipitate is discharged through 2-in. plug valves at the hopper bottoms into a common system of launders that carries it by gravity to a 5x5-ft. leaching tank, the overflow going to a second similar tank. A 2½x3-in. triplex pump, connected to each tank below the filter cloth, rapidly dries the precipitate, pumping the solution back to the head of the zinc boxes. It takes two men eight hours to clean and repack the boxes.

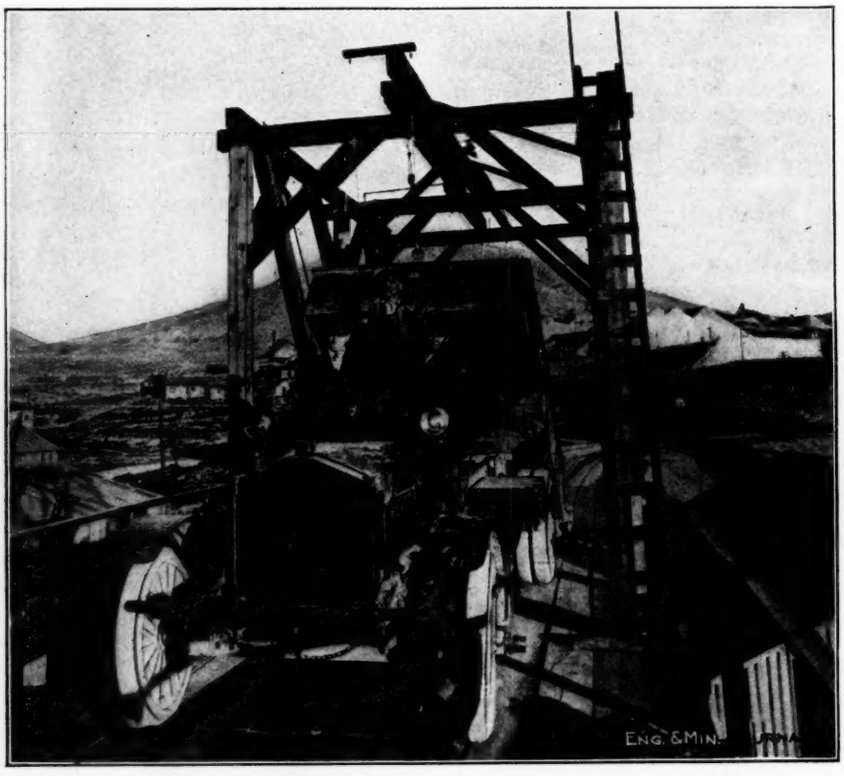
The precipitate is dried in a 15x5-ft. steam drying pan and after fluxing it is melted in an oil-fired Faber du Faur furnace. The life of the graphite crucibles has been materially lengthened by the experiment of coating them with a thin application of Johns-Manville "Brickline," which effectually prevents the oxidation of the crucible from the outside. Fourteen hundred-ounce bars are poured and cleaned while at a red heat. The slag is poured while still molten into a cement pit filled with water, which granulates the slag for future jigging.

The mill is heated by an oil-fired boiler, the live steam from which is used only to heat the solutions in the Trent agitators, the mill building deriving its heat from the solutions in circulation. The oil is stored 100 ft. from the building in steel tanks which are filled by gravity from oil cars. Oil is fed to the boiler through a 3-in. pipe and an oil pump. The exhaust steam of the pump passes back through the 3-in. supply pipe in a 1½-in. pipe. This keeps the oil warm in the coldest weather.

After impounding the tailings for some time, a pumping plant was installed to pump the slime over a neighboring ridge. The slime cake on the filter leaves is thrown off into the wash water by high-pressure water and, without decanting, the bottom valves of the hoppers are opened until the slime is out and the discharge becomes thin. The slime cakes are all discharged with the force of the water head in the box and, striking in a launder which has a 4% grade with bends and iron riffles, the same is thoroughly mixed before entering a 24-in. No. 14 riveted-iron pipe, which is 700 ft. long and has a 4.8% grade. At the end of this pipe an 8-in. suction pipe connects it directly to a 6-in. Campbell & Kelly centrifugal pump, driven by a 30-hp. motor. T pump discharges through 300 ft. of 6-in. No. 18 riveted-steel pipe on a 12% grade. As the slime is all discharged from the hoppers in four minutes, it almost fills the large pipe and puts a heavy suction head on the pump, aiding materially in pumping out the heavy material that comes first.

It takes 20 minutes to pump out a charge and the power required is 28 hp., with a maximum of 29.5 hp. the first five minutes and a minimum of 26.8 hp. the last five minutes. Ten minutes after the first discharge from the filter each hopper is opened for a few seconds to let out any settled slime and to furnish a water wash for the 24-in. pipe. This is the last material to enter the pump. Consequently after pumping, the drain of the 6-in. pipe back into the 24-in. pipe aids in thinning the first thick slime of the next charge. The total amount of water used to discharge is between 80 and 100% of the weight of the dry slime.

The use of two types of mortars, of thickeners only 16 ft. in diameter and other like items, is due to the fact that the mill was remodeled from the 20-stamp mill known as the Midway mill, which was operated in 1906 and 1907 by the Tonopah Mining Co., as a concentrating, leaching and slime plant. The Tonopah Mining Co. had in turn remodeled it from a 10-stamp pan-amalgamation mill built in 1902; this was the first mill to operate on Tonopah ores. The changes made in the reconstructions of this mill are of interest as they mark the advancement made in the treatment of silver ores in the last 10 years.



MOTOR TRUCK DUMPING OVER OREBINS AT WEST END MILL, TONOPAH, NEV.

PRESENT MILL A REMODELED PLANT

The first mill consisted of ten stamps of the design known as "Boss" batteries with a steel-cantilever battery frame and concrete ore bins; described in the ENGINEERING AND MINING JOURNAL, Mar. 10, 1904. It is of interest to state that the battery foundations as championed in that article are still sound, but that the vibration of the steel cantilevers caused the 30-in. concrete supporting wall to start crumbling. The batteries were followed by two Huntington mills, three settling cones and eight regrinding and amalgamating pans. The power was supplied by a 120-hp. Diesel gas engine.

When the mill was remodeled by the Tonopah Mining Co., 10 stamps of Fulton pattern were added on the cantilever battery frame. The Huntington mills, increased to three, were moved down a floor, and the cones brought up ahead of them. The regrinding pans were discarded and four Wilfley tables placed on that floor. A cyanide plant was added, consisting of a double tier of twelve 16-ft. leaching tanks, three combined settlers and agitators of an early Trent agitator design, a Butters filter installation, a zinc room and other necessary tanks. Power was supplied by motors.

As the cost of treatment in this small mill by practicing concentrating, leaching and sliming, was greater than at its 100-stamp mill of similar design at Millers, Nev., all the ore was later given to the larger mill. However, the erection and operation of the Montana Tonopah and Tonopah Extension mills in Tonopah as all-sliming mills, and the operation of the latter on low-grade ore as a nonconcentrating mill, simplified the milling of the Tonopah ores and, in 1911, the West End Consolidated Mining Co., took over the mill. S. H. Brady, the general manager, and J. A. Carpenter, the metallurgical engineer, drew the plans and reconstructed the mill as outlined above.

The batteries were changed from 10-stamp to 5-stamp units, the defective concrete wall was replaced by steel columns and a steel column was placed under the end of each steel cantilever I-beam in order to reduce the intense vibration that had, previously, constantly sheared rivets, loosened bolts and thrown the stamp stems out of plumb. The cone classifiers below the batteries were replaced by Dorr classifiers, the Huntington mills by tube mills, the concentrating tables by Dorr thickeners and the combined leaching and slime plant by a modern slime plant with large Trent agitators and a 100-leaf filter. The smaller tanks of the old mill were used again as auxiliary tanks, their capacity in several cases being increased by raising the sides 3 or 4 ft. by No. 12 sheet iron. Except for a refinery that the old mill did not have, no additions or changes were made to the mill building; yet the daily capacity of the mill was doubled by reconstructing it.

In March, the direct cost of milling was $3.52 per ton of ore, with a recovery of 90.4% on $17 heads. The main items of cost were: Labor, 85.5c.; power, 71.5c.; cyanide, 72.5c.; zinc, 18c. and pebbles 9.8c. The total crew, including the superintendent, numbers sixteen.

After seven-months' operation of the mill with varying grades of ore, the conclusion reached is that with a $10 to $14 ore an extraction can be made without concentration equal to that with concentration, with a lower milling cost and a saving of 3 to 4% in marketing products. With $14 to $18 ore this saving is gradually counterbalanced by lower extraction and solution troubles. When the value of the ore goes above $20 concentration will pay in extraction results above its extra costs. The question of the method used would depend upon the probable grade of the ore reserves. Plans are now being drawn up for a concentrating addition to the present mill.

Hungarian Mineral Production for 1910

The mineral output of Hungary for 1910, is given in the official reports as follows, the items standing in order of decreasing values: Lignite, 7,578,846 metric tons; pig iron, 502,056; bituminous coal, 1,085,132 metric tons; gold, 3041 kg.; coke and briquettes, 264,921 tons; iron ore for export, 645,000 metric tons; silver, 12,547 kg.; pyrites, 92,464 metric tons; lead, 2077; copper, including cement and ore, 6194; bitumen, 4994; mercury, 0.900; antimony, crude and refined, 0.782; litharge, 570 metric tons.

Forbestown District, California

By Lewis H. Eddy*

The Forbestown district, situated in Butte and Yuba Counties, was an active producer of gold and silver for 18 years prior to 1899. The use of inefficient methods of mining and milling was the chief factor causing the abandonment of the quartz mines; modern methods may again make these mines important producers.

The Forbestown mining district in Butte and Yuba Counties, Calif., includes quartz mines and placers that were large producers of gold for a period of 18 years prior to and including 1898. Forbestown is in the center of the district, situated at the head of Forbes Ravine, 22 miles east of Oroville on the Oroville and La Porte stage road. The principal producing mines within a radius of one mile east and west and three miles north and south were the Gold Bank, Golden Queen and Shakespear; the Burlington Gold Mines; and the New York and Ohio Flats placers.

Three Mines Chief Producers

About 75% of the quartz-gold production came from the Gold Bank, Golden Queen and Shakespear, then operated under separate ownership, and at present included with the Miller and other quartz and placer claims in the ownership of the Forbestown Consolidated Gold Mines, M. J. Cooney of Oroville, president and general manager. The Burlington gold mines, including the New Burlington, Mexican, Jo, Annette, and adjoining placers, are owned by the Burlington Gold Mining Co., W. C. Ralston, Royal Insurance Building, San Francisco, president and general manager.

The northerly portion of the district is in Butte County, the southerly portion in Yuba County. The general strike of the formation is northeast. The country rock is generally described as amphibolite. The wall rocks are chiefly greenstone and diorite. There is a massive granite formation about four miles north striking southwest and extending about three miles to the south fork of Feather River. On the south side of the river the rock changes to granodiorite.

The trend of the veins in the Gold Bank and Golden Queen, at the north end of the district is east to west. The dip is irregular, but generally to the northeast. In the Burlington and Shakespear and the Miller the trend is east of north, the dip being more constant to the west. In the Gold Bank and the Shakespear, there are evidences of the dip changing to vertical.

The outcroppings of the Burlington and Shakespear are extensive, varying in width from 10 to 30 ft., and prospect well in the pan. The Gold Bank and the Golden Queen at the north have also extensive croppings on the same vein series, which in places are 30 ft. wide; the larger and more extensive cropping is on the Gold Bank, and is particularly noticeable near the shaft on the west of Forbes Ravine. Pay ore has been mined in the Burlington and Shakespear at from 100 to 250 ft. vertical depth, and judging from the stopes in the upper levels of the Gold Bank and Golden Queen, pay ore has also been taken from near the surface in those mines.

Good Prospects at Depth

The elevation at the apex of the Burlington is 2924 ft. The deepest working is at 2700 ft. elevation. The elevation at the shaft house of the Gold Bank is 2640 ft.; the tunnel plane is at 1870 ft. and a winze 300 ft. deep makes the elevation at the lowest working of the Gold Bank 1570 ft. The dip in the Gold Bank straightens at depth, and the opinion has been expressed by a competent engineer that the dip of the Burlington will change to the east at depth, while another reported the dip in one of the Burlington claims to be 55 to 65° northeast. These conditions confirm the belief that vertical veins having a northeast trend will be disclosed by deep mining.

Placers Yielded Well

The placer mining in the district included Forbes Ravine and other smaller ravines, and New York and Ohio flats, which are situated on the southern end of the district, and east of the Miller and Deadwood claims. These placers yielded rich returns, and were worked persistently until the law demanded the impounding of tailings from hydraulic workings. When the flats had been cleaned to the bedrock, the miners followed the pay toward the quartz croppings and worked up to the Miller, Shakespear and Burlington. The pay dirt of the placers was not gravel of stream origin, as is usual in placer ground, but a formation of red earth, evidently disintegrated from the quartz veins, and was worked by hydraulicking up to but not above the ledges.

The director of the U. S. Mint in 1880 credits the New York and Ohio Flats with a yield of $12,000 to $30,000 per acre, in a depth of 12 to 20 ft. There were, conservatively estimated, 500 acres of this character of ground in these flat and ravine placers, yielding an approximate total of $10,000,000. Adding to this the reported production of $4,000,000 from Forbes Ravine and other ravines and gulches in the vicinity of the Gold Bank vein, and the reported output of the Gold Bank and Golden Queen mines of $1,806,000, the Forbestown district has produced an approximate total of $12,000,000 to $16,000,000.

Gold Bank-Golden Queen Mines

The important history of the development of the Gold Bank and Golden Queen, so far as it directly concerns the present situation of these and adjacent properties at Forbestown, embraces four years from 1894 to 1898. In 1896 the owner of the Gold Bank secured a lease of the Golden Queen, which terminated in October, 1898. Under the operation of the two years' lease the Golden Queen produced $374,000, on which a royalty of 25% was paid to the owner. Prior to the leasing the mine had produced $60,000, making a total of $434,000. The Gold Bank in the life of its operation produced $1,372,000. Thus an aggregate of $1,806,000 resulted from the operation of these properties severally and conjointly up to and including the year 1898.

The closing down of these large producers and the abandonment of development work in other mines in the district may be attributed to various causes which in the concrete are resolved into one: The failure to adopt the best methods of development, extraction and treatment. The immediate cause for the closing of the Gold Bank and Gold Queen was the disagreement between the respective owners as to operating the two properties as one mine, which is the only practical and economical method of making a large mine of either. The mine was not worked out.

In the accompanying table is given a summary of the work done by the Gold Bank Mining Co. on ore from the Golden Queen during the life of the lease. The low average value of the ore indicates that the whole amount extracted was put through the mill, and though the cost of operation was excessive as compared with present-day methods a fair profit of $1.65 per ton was shown. The cost of treatment would in present-day operation be reduced by substituting cyanidation for chlorination.

About 20,000 ft. of Underground Workings

The underground workings in the Gold Bank and Golden Queen mines include an inclined shaft on the dip of the vein; 10 drifts east and west; five lateral tun-

nels; a working drainage tunnel intersecting the vein and the winze from the lower tunnel in the Gold Bank; two tunnels and drifts from the Gold Bank workings into the Golden Queen; two tunnels on the Golden Queen proper. Including stopes and raises, the aggregate workings approximate 20,000 feet.

The Gold Bank and the Golden Queen are adjoining claims on the same vein, having a total length east and west of about 3600 ft. The inclined shaft is 8 ft. wide following the footwall 1600 ft. to the place of the working-drainage tunnel. The tunnel is 8x8 ft. and 2500 ft. long, intersecting the ledge at 1250 ft. from the portal, and at 950 ft. vertical depth from the collar of the shaft. The winze in the main tunnel is 300 ft. deep, making the total vertical depth of the ground explored in the practical operation of the mine 1250 ft. from the collar of the shaft, which is the lowest outcrop of the vein.

PARTIAL REPORT OF TWO YEARS' OPERATIONS OF GOLD BANK MINING CO.

Gold, silver and copper	$372,880.55
Gold from mill	138,317.50
Gold from concentrates	208,927.68
Gold from copper cement	6,352.21
Silver	19,283.16
Merchandise sold	1,205.38
Income	374,085.93
Expense	241,751.14
Profits	132,334.29
Average profits monthly	5,513.93
Tons of ore crushed	79,689.00
Average value per ton	$4.68

In November, 1911, the water in many parts of the tunnel was 18 in. deep; this is now drained. In no part of the shaft was the ladder and tram equipment in repair. The only evidence of preservation of equipment was the remnants of an ore chute 3½ ft. wide evidently kept intact by the constant stream of water passing over it and illustrating the method of transportation of ore after the shaft had been opened into the working tunnel.

Evidences of disregard of systematic mining or practical development were numerous; passages gouged out that would scarcely admit the body of a man; chambers large enough to have inclosed the shaft house; so called drifts that formed caves; everywhere disorder and irregularity; nothing to indicate practical work except in the sinking of the shaft, and that was a mere matter of following the footwall.

The Shakespear and Miller

The Shakespear group is composed of three adjoining claims along the trend of the ledge, having a total length of 4200 ft. In addition there are about 100 acres of ground adjoining. The mine was owned and operated in the prosperous days of Forbestown by Alvinza Hayward. The property is situated south of and adjacent to the south end of the Gold Bank and approximately parallel with the Burlington, the grounds of the two properties abutting at the southerly ends. The vein averages about 7 ft. in width between diorite and syenite and dips west at 50 degrees.

A main shaft was sunk 215 ft., near the center of the claims, and at 200 ft. the vein was drifted on for a length of 600 ft. south where a raise was made to the surface. At the same depth the drift was extended north 350 ft. In each of these drifts an oreshoot was disclosed dipping to the north. Stoping in the main inclined shaft at the bottom opened 20 ft. of vein matter. At 300 ft. north of the shaft a winze was sunk in rich ore. In all these workings high-grade ore was disclosed, and in some instances extraordinary assays were reported. One record shows that 187 tons of unselected ore taken from the winze yielded $2265 on the plates and $545 in concentrates or an average of $15 per ton. But this was considered low grade at that period. Ore that will yield one-half that amount in the present undertaking will be considered sufficient inducement for extensive development.

The Miller property is situated at the southwesterly end of the district and embraces about 70 acres of ground. The vein has a northerly trend and dips west at 60°, generally, but in some parts flattens out to 37°. Some cross veins or feeders dip to the northwest. The property was not developed into a paying mine, for the apparent reason that the operators were in too great a hurry to complete the surface equipment. A 3-compartment working shaft was sunk 240 ft. on the Miller vein, which is intersected by the Shakespear just southeast of this shaft. There is an overburden of red earth on this property that has in numerous places been hydraulicked off exposing the blind quartz croppings. The present owners of the property have exposed these blind croppings for a distance of 2000 ft. which were sampled and gave satisfactory returns.

The adjoining claim on the west known as the Deadwood and the placer grounds on the east were large producers in the early days of the district, and the prospect of making a mine of the Miller is based to some extent on the past history of this section of the district. The character and quality of the ore exposed in the shaft and in the surface prospecting indicate a strong probability that the former owners would have profited by the development that could have been done with the $100,000 expended in surface equipment, which was soon abandoned.

Burlington Gold Mines

The boundary line between Butte and Yuba Counties divides the Burlington property into halves. The present underground workings are in the south half of the property, and are about one mile southwest of Forbestown. There are four claims having a total length along the ledge of 4500 ft., and three parcels of land at the south end aggregating 50 acres, also on the croppings, making a total length of about 5400 ft. The claims, in their order northward, are the Annette, Jo, Mexican, New Burlington.

In the early life of active mining in the district the Burlington produced pay ore which was treated in a custom mill, but there is no complete record of the quantity or value. The ore was extracted chiefly from the Mexican claim. The results of the early operation of this mine induced renewed prospecting and development which have disclosed a well-defined vein on the Jo claim having a width of 6 to 8 ft. showing from $6.80 to $16.44 per ton of milling ore, and $80 to $100 per ton of sulphurets.

Prospecting From Jo Tunnel

Evidences of hydraulic mining appear in all the ravines extending to the ledge which crops boldly along the entire length of the claims, and the strength of the ledge is indicated by the deeper prospect shafts and opencuts. In general the croppings show well in pan colors at all points. The reason for undertaking the initial new development by driving the Jo tunnel was that it is about the only favorable place for opening the ledge by tunnel, and it was more economical to follow the ledge or vein exposed near the surface than by sinking on a dip of 60°. The advancing of the tunnel is not to be abandoned, but future prospecting and development will be by vertical shafts from which the vein may be cross-cut and drifted on at much greater depth than can be attained by tunneling.

The Annette claim has been prospected by a tunnel 70 ft. long driven northwest and cross-cutting the vein matter. The results of this work are not definitely known, as the tunnel has long been caved. The New Burlington has been prospected by surface shafts, the deepest of which is 35 ft. The ore exposed contains a large percentage in sulphurets and shows strong colors of free gold in the pan.

Jo Tunnel 305 ft. in Ore

The portal of the Jo tunnel is on the dividing line between the Jo and Annette a little west of center. The tunnel has been recently advanced to a total length of 400 ft., the last 305 ft. of which is in ore. A raise and four crosscuts are likewise in ore. The plane of the tunnel is at an elevation of 2700 ft. and at 225 ft. vertical depth from the apex of the Mexican which is the highest point of the entire property. The first crosscut is across the east side of the vein at 195 ft. in from the portal; at 240 ft. in the vein is crosscut to the west; and again at 275 ft. it is crosscut to the west; at this point there is a raise on the east side; at the breast of the tunnel there is another crosscut to the west.

The vein is shown at these various crosscuts to be 6, 7 and 8 ft. wide. The

course of the vein or ledge as disclosed by the tunnel workings and indicated by the surface croppings along the full length of the four claims is about 20° east of north and west of south. The dip is west 55 to 65 degrees.

The vein matter in the tunnel and in the deeper prospect shafts is white quartz with frequent bands or ribbons of blue quartz highly mineralized with pyrite and galena. The walls are described as diorite and greenstone strong and well defined, with a clay selvage on the footwall, which with the presence of slickensides is taken as evidence that the ledge will prove to be a true fissure.

Systematic Prospecting Planned

The contemplated new prospecting and development includes the sinking of two vertical shafts, one at the northerly end of the New Burlington, the other at about the center of the Mexican. Sinking the shafts each to a depth of 500 ft. would, with the Jo tunnel, give three levels at approximate elevations of 2700 ft., 2425 ft. and 2200 ft. The lowest of these levels would be approximately at 330 ft. higher elevation than the plane of the lowest tunnel of the Gold Bank which is 950 ft. below the collar of the Gold Bank shaft.

The estimated cost of prospecting and development on the plan above described is placed at $75,000. This would provide for two 3-compartment 5x15-ft. shafts each 500 ft. deep, a total of 1000 ft. at $30 per ft., $30,000; 300 ft. (estimated) crosscuts to the ledge, 200 ft. crosscuts on the ledge, 4500 ft. drifts on the ledge, total 5000 ft. at $5 per ft., $25,000; erecting and housing hoist and pump engines, $15,000; total actual cost, $70,000; add $5000 for contingent expense; making a safe total of $75,000 for prospecting to the ledge and permanent development of the ledge.

Good Surface Equipment in District

In the active quartz-mining period in Forbestown district the surface equipment was ample, and with added improvements and the adoption of cyanidation the extraction and treatment of the ores should have continued to and indefinitely beyond the present. A comparatively small amount of dead work was done in the exploration and development of the mines. A total of 110 stamps was installed and operated in the camp; the Gold Bank had 40 in 1894 and added 20 in 1895-6; the Golden Queen, 10; Shakespear 10; Miller 20; and a 10-stamp custom mill.

There is no positive record of the gold and silver content or the percentage of extraction that covers any certain period; but the evidence is clear that much of the ore contained in free gold from $5 to $15 per ton, and that the 1 to 1½% of sulphurets treated by chlorination yielded from $100 to $250 per ton. In 1892-94 the chlorination works at the Gold Bank and the canvas plant at the Golden Queen treated a total of five to six tons of concentrates per day. The cost of treatment including milling and chlorination averaged about $2.75 per ton; miners and other skilled laborers were paid $3 per day; other labor $2.50 to $2.75 per day. Timber cost $13 per 1000 ft.; lagging, 3½c. each. As an example of cost of excavating, the working drain tunnel in the Gold Bank cost an average of $10 per ft.; other tunnel work from $5 to $15 per foot.

Gold Bank Mill the Largest

The surface equipment of the Gold Bank in 1890 included a hoist and pumping plant, one No. 2 Gates crusher, four 5-ft. Huntington mills, eight Victor concentrators; chlorination plant equipped with a reverberatory furnace with three hearths, the revolving barrel was 4x4 ft. holding 1½ tons. The entire surface plant was operated by nine hurdy-gurdy water wheels of varying sizes from 28 in. to eight feet. The pressure at the hoist was 175 ft., at the mill 240 ft., at the chlorination works 265 ft. In 1892, the mill had been remodeled; the rotary mills were removed and a 20-stamp mill installed; the stamps had a 7-in. drop and were operated at 90 to 100 drops per min.; the crushing capacity was 2½ tons per stamp in 24 hr.; the chlorination works handled about three tons per day, making two charges. Two years later 20 more stamps were added to the plant and 16 Frue concentrators installed. Twenty more stamps were subsequently installed making a total of 60 stamps. The exact date of the initial equipment of the Gold Bank is not available.

The Golden Queen was equipped with a 10-stamp mill about 1891. The ore was broken in a No. 2 Gates with a capacity of 200 tons; the broken are passed to Hendy feeders; the stamps weighed 750 lb. each and made ninety 4½-in. drops per min., crushing three tons each per 24 hr.; the stamp shoes were steel working on iron dies; the silver-plate aprons were 1½ ft. long and were cleaned up once a week. The pulp after passing the aprons passed over a 16-ft. sluice plate 16 in. wide, to blankets, then to a series of sluices with occasional cross slats, which took out the coarser pulp; the tailings were worked in a canvas plant. About two tons per day were treated. This mill also was operated by water power.

The Shakespear mill and chlorination works were installed and operated in the busy days of the camp, but when abandoned were left to decay. The Gold Bank, the Golden Queen and the Miller mills still remain intact and considering the 15 years of idleness are in fair repair, and could be put in working order at moderate expenditure.

Miller Plant Was Modern

The Miller plant is of later installation and more modern design; it was operated by Pelton wheels at both mill and hoist. The whole plant could be put in operation and extraction and treatment of ore resumed at small cost and with but little delay. The mill is composed of 20 stamps, with spitzkasten and four Wilfley tables, grinding pan, amalgam washer, and other accessories requiring but little adjustment.

The headgear at the shaft is connected to automatic car-dumping devices. There are ore bins and waste bins; also a Gates crusher that was never used. The hoist and the Pelton wheels are practically new, as are all the parts of the plant, as only a few tons of ore were extracted and treated. The hoist and crusher, and the jackhead for pumping the shaft are equipped to be run by water power delivered through a 14-in. steel pipe 1150 ft. long connected to a penstock at the Forbestown ditch. The stamps and concentration tables are likewise equipped with 14-in. pipe 1600 ft. long connected to the same penstock. There is also a Knowles sinking pump and other machinery; also a complete assay plant equipped with new retort, melting furnace and assay furnace.

In the day of its installation the Miller equipment was a modern and model plant, with one exception. The mill is situated about 600 ft. distant from the working shaft in an excellent topographical position but no better than is afforded immediately adjacent to the shaft; and the tramway was poorly constructed and inefficient.

The ores mined in the Burlington were treated at the custom 10-stamp mill at Forbestown, which was I believe the first mill installed in the district. There is no record of this plant from which the details of its construction can be learned. This mill handled the ores from various mines in the district and was an enterprise of considerable importance in its day.

This history of the mining and milling of ores in the Forbestown district is written from the available records and a visit including the whole surface of the district and a greater part of the underground. There is nowhere any evidence of the mines being worked out. On the contrary the camp is evidently a big producing prospect that required the dropping of a total of 110 stamps for several years and the operation of chlorination works and canvas plants, and the excavation of approximately 30,000 surface feet and extraction of several hundred thousand tons of ore. But it is still an undeveloped prospect in relation to permanent deep mining.

Lime in Cyanidation

By J. W. Hutchinson*

The following notes cover the practice of adding lime at the Goldfield Consolidated mill, Goldfield, Nev. The ore is crushed, concentrated and settled in water, no contact with cyanide solution occurring until the pulp has reached the Pachuca agitators. The bulk of the lime is used not only for neutralization and coagulation, but also for protective alkalinity and is added as a lime emulsion at the main launder leading from the concentrators to the dewatering tanks.

Lime Added as Emulsion

The lime-mixing plant, situated about 200 ft. from the main mill building, contains a storage bin, having a capacity of 120 tons, from which the lime from the railroad cars is dumped. The lime from this bin is slacked in cement buggies for the purpose of breaking down the large lumps, and dumped into two 4-ft. grinding pans. A stream of mill-service water is kept running into the pans (they have no mullers, acting as mixers or emulsifiers only), which overflow a lime emulsion. This product is conveyed in sheet-iron launders to the different departments of the mill and cyanide plants. Wooden launders were not serviceable for this product and required constant repairs. This system requires no extra labor and little power, and has the advantage of absolute control at all times. The only disadvantage is a slight loss of lime from undissolved particles when the accumulations in the pans are cleaned out.

The helper in the cyanide plants attends to the lime and regulates the amount to be used by taking a sample of the overflow from the dewatering tanks every two hours. This is one of the most important departments in the mill and has a great effect on the tonnage, since the maximum settlement takes place within exceedingly narrow limits of lime in solution. Ordinarily this overflow is held at 0.3 to 0.5 lb. CaO per ton of water, and a variation of 0.2 lb. either way from these figures results in decreased tonnage. By adding the lime in an emulsified condition, this regulation is possible. The overflow sample with this method is also an indication that the charge will contain approximately the same amount of protective alkalinity when transferred to the agitators.

At some plants where fine grinding is not required and the sand is leached, a stamp is successfully used for pulverizing the lime, since the coarse particles will be classified out with the sand and maintain a uniform protective alkalinity during leaching. Similarly the overflowing slime will contain no undissolved lime and the slime charge will have the same alkalinity as the overflow from the classifiers. The inadaptability of this method to an all-slime plant is obvious. Occasionally at this plant, when the helpers have been negligent in slacking the lime before dumping into the pans, the overflow sample is no index of what the slime charge will contain, the latter containing 0.5 to 0.8 lb. more CaO than the overflow sample would indicate.

Approximately 12 sq.ft. of settling area is required per ton of ore, in order to dewater to 40% H_2O with no mechanical or continuous device for drawing off the thickened sludge. The manufacturers of the best known continuous thickener recommend 8 sq.ft. with their device, which does not operate well when delivering a product containing less than 50% H_2O. When it is necessary to crush in water, it seems there is nothing in favor of continuous thickening, provided it is possible to regulate closely the alkalinity of the water in which the charge is collected. It was inadvertently demonstrated here recently in trying to crush this ore in solution, that if it were necessary to carry such alkalinity as is required with silver ores (from 1 to 1.5 lb. CaO per ton of solution), it would be impossible, even after 48 hours' settlement, to thicken the pulp to greater density than 1.3. This would reduce the tonnage by approximately 25 per cent.

Better Results Crushing in Water

Though contrary to the experience of others on other ores, it has been demonstrated here conclusively that it is not possible to obtain so high a recovery when crushing this ore in solution, as when crushing in water and giving a preliminary alkaline treatment. This experience is borne out in part by the Alaska-Treadwell company, whose concentrate is subjected to a preliminary treatment with lime before cyanidation; also by the experiments of E. M. Hamilton on concentrates, recently described in the Engineering and Mining Journal. He states that at one property he was able to extract a high percentage of the precious metals from a rich silver-gold concentrate, after a preliminary treatment with lime.

On this ore, with the same period of agitation, the difference in extraction when crushing in solution is 2%. We have demonstrated this, not only in the laboratory, but by actual tests in the mill, lasting three weeks. Further, we have shown that longer time is required to reach the point, after which no gold dissolves, when the ore has been crushed in weak solution; that more lead is required; and though the total cyanide consumption in the plant is lowered, the chemical consumption of cyanide is markedly increased. In the laboratory tests the stock solution was checked with a new solution, in order to determine whether or not the lower extraction in a given time was due to decreased efficiency of the stock solution. However, the two solutions checked repeatedly and in all instances showed that when crushing this ore in a weak solution, nearly 30% more time is required for dissolution of the gold than when the ore is crushed in water and given a preliminary alkaline treatment before any cyanide comes in contact with it. The reason for this is not known definitely, but may be accounted for by the "Physical Effect of Weak Solutions," p. 85, "Cyaniding Gold and Silver Ores," by Julian and Smart.

Crushing in Solution Now

In the past, the ore has been of such grade that it has been more economical to stand the mechanical loss of cyanide (and higher costs), due to crushing in water, and take the higher extraction. At present we are crushing in solution, and by lengthening the time of treatment from 28 to 36 hours, are obtaining a saving within 1% of what can be done with the other method and are avoiding the mechanical loss of cyanide. There is one marked advantage in crushing this ore in water, followed by the alkaline treatment, which has never been appreciated before, viz: The neutralization of the soluble potassium aluminum sulphates, which are abundant. Never since the mill started had the solutions shown any tendency to throw down the gelatinous aluminum precipitate, which is so detrimental to filter cloths and precipitation, until we changed the process.

This was especially noticeable in the solutions coming from the roasted concentrate. This product had always been neutralized with lime slacked in water. The first charge which was neutralized with lime slacked in weak solution threw out so much aluminous precipitate in the gold tanks, that it was impossible to force the solution through the clarifying presses. This was overcome in the subsequent charges by running a fresh-water line to the lime house and slacking the lime for the roasted product in fresh water. In some of the experimental work on the roasted concentrate, caustic soda was used instead of lime. Its use, however, would be precluded by the cost, and the additional disadvantage that it is not a good coagulating agent, but lends itself to the formation of colloidal suspensions, which cannot be settled even with the addition of lime, and that it tends to bring soluble sulphides into the solution.

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The Russian customs department has given notice that iron pyrites containing less than 3% copper shall be classed on importation as "iron ore not separately distinguished," says the *Chemical Trade Journal*, but if containing 3% or more of copper shall be classed as copper ore, and pay duty as such.

Mining Copper at Lake Superior—II

By Claude T. Rice

The Allouez and Ahmeek companies sunk shafts inclined at 80° instead of vertical shafts. When the lode was reached these shafts were flattened to follow it. The only two Whiting hoists in this country are at the Red Jacket vertical shaft, which opens the Calumet & Hecla conglomerate. The conglomerate inclined shafts contain either two or three compartments, and are sunk in the lode. The inclined amygdaloid shafts are either in the lode or parallel to it in the foot wall.

The inclined shafts generally follow the lode at the amygdaloid mines and always do so at the conglomerate mines, for the foot-wall flows under the conglomerate are so weak that a shaft cannot be kept open in them. At the amygdaloid mines, some of the shafts have been sunk with the foot of the lode as the hanging of the shaft, but generally such a shaft is placed at some distance in the foot wall. As considerable trouble has been encountered with some of the shafts within 30 ft. of the vein, it has been decided that a foot-wall shaft should not be less than 60 ft. from the lode. With the shaft at that distance, it has been found in the upper part of the Wolverine mine that the ore can be stoped out over the shaft without any danger and that no shaft pillars are required in the lode to protect the shaft. But the mining of the ore directly over the shaft is not good practice.

The distance at which a shaft should be placed in the foot wall in order to permit cutting of bins and pockets over it in the deeper parts of the amygdaloid mines, is still a problem, and, owing to the experience at the Quincy mine, where the shaft in the foot wall is the one giving the most trouble in the deepest workings, some in the district are inclined to believe that a shaft in the lode is easier to maintain than one in the foot wall; where the hanging is left standing on pillars and a general movement starts, great pressure is thrown on the shaft pillar, and there is a greater tendency for the workings to slab off in the more compact flows of the foot wall than in the more amygdaloidal flows of the lode. In the deeper workings of the Red Jacket shaft, it is found that the foot-wall flows give much trouble through scaling off of the roof and sides and swelling of the foot, even at points 100 ft. or more from the lode in the crosscuts; a lateral drift at a depth of 5000 ft. on the dip of the flows in the Calumet No. 2 workings, gives similar trouble when following flows 200 ft. away in the foot wall of the conglomerate. In these instances, this trouble does not come from oxidation of minerals in the flows, but from pressure.

Shafts in Lode and in Foot Wall

Whether it is best to put the shaft in the foot wall or to follow the lode with it, even in the upper part of the mine, is entirely undecided in the minds of the men operating the flat-dipping mines in the northern part of the district. The principal advantage of the foot-wall shaft, other than that in the upper parts of the mine it requires less timber to keep it open, is that it permits the placing of loading bins directly over the shaft with most of them cut in ore. However, the use of bins over the shaft is not looked upon with favor by many of the most experienced men at these northern mines. Therefore, if bins are not to be used but the skips are to be loaded either by dumping the cars directly into them or from a small measuring pocket cut in the floor of the station, one of the main reasons for sinking the shaft in the foot wall is removed. Another advantage that the foot-wall shaft formerly held, namely the practical immunity from fire, is fast disappearing, owing to the increasing use of reinforced concrete for supporting the ground where the hanging of the shaft is heavy.

The disadvantages are that the shafts in the foot wall cost more to sink than those in the lode, for the partings between the flows, from which to draw the cuts are less prominent than in the case of the lode; there is no ore coming from the shaft to help pay for its sinking; there is the necessity of crosscutting to the lode on each level and of cutting a station in rock. The most important reason, in case of a working shaft being sunk to prospect a lode, as is the general practice in the copper country, is the fact that there is no information concerning the lode coming from the shaft itself. This last objection has less importance at operating mines, and it is questionable whether it is not the wisest policy at new mines to sink a small shaft following the lode and to do all development from it until the grade of the lode is determined. If the ore is rich enough to pay, the working shaft can be raised from several different levels at the same time, placing the shaft either in the lode or in the foot wall, as is thought best, in the light of the information that has been obtained.

Dead Work Reduced to Minimum

Unless one is accustomed to working mines where a profit must be made from ores yielding only 13 lb. of copper per ton and having payable widths that do not average much over 12 ft., although in some instances swelling out to 20 ft. or more, he is not apt to appreciate the importance of keeping the work in the ore as much as possible and of avoiding dead work. With the shafts placed as close together as they are, 3200 ft. is the maximum interval between shafts, and this is between Osceola Nos. 13 and 14, the average distance being 1600 ft., the tonnage to which dead work can be charged is small compared to that served by a level at low-grade copper mines of other districts, where, in the vein mines, orebodies often have a width of 50 ft. This distance between shafts, however, is being rapidly increased at the newer shafts in this district.

Hand tramming is used entirely in the flat-dipping amygdaloid mines in the vicinity of and north of Calumet, and it is that which has limited the distance between shafts. Experiments are now being tried to concentrate hoisting from several levels at one level, and it is probable that in time the Red Jacket system of subshafts will be tried at some of the amygdaloids, to permit electric or

Surface Works, Allouez Mine, Michigan

some other variety of mechanical haulage, and the attendant increase in the distance between shafts. Experimenting, however, has to proceed cautiously with the margin of profit as low as it is when copper sells under 13c. per lb. The experience at the Tamarack and the Red Jacket shafts, where long crosscuts are necessary to reach the orebodies from the vertical shafts, has made mining men in the Lake district cautious in adopting any method that entails much dead work. The operators appreciate the fact that the grade of the ore from which copper can be mined at a profit, depends largely upon making every foot of work count; that simple methods must be perfected in which little dead work is necessary in the deeper parts of the properties to be mined. Experimenting has been rendered more cautious since it has been seen that the reason for the failure of the Calumet & Hecla to make profits from the Osceola lode when first opened, was that an experiment in mining was tried in which too much work was done in the foot wall and the principle of clinging as closely as possible to the ore was neglected.

Steep Inclines Instead of Vertical Shafts

Profiting from the experience of the Calumet & Hecla and the Tamarack companies with their vertical shafts, the Ahmeek and the Allouez, which do not own all the outcrop of the Kearsarge lode that can be worked in their properties, sunk inclined shafts having angles of 80° until they reached the lode, when they turned off on arcs of circles to the dip of the lode and followed the ore. At the Allouez shaft, which was the first in the copper country to be sunk with a considerable change in its dip at depth, the curve at the point of flattening was simple and had a radius of only 85 ft., but at the Ahmeek, a compound curve with several hundred feet radius to each part was used. The Centennial company, on account of its owning only a small length of the outcrop on the Kearsarge lode, sank one of its shafts straight down on the dip, while the other shaft, which had to be started within about 50 ft. of the first shaft so as to start it in the lode, had to be given a considerable lateral turn in order to reach the portion of the property below the South Kearsarge workings; the shaft at depth parallels the boundary line which cuts across the lode at an angle of about 45° with its strike.

In making the turn, a compound curve with a small reverse at the end was used, to keep the rope from leaving the rollers. The skip must be slowed up slightly at the curve, but other than that and a somewhat greater wear upon the rollers, little inconvenience is noted in hoisting. While this is probably the only shaft in the world that has purposely been given a side swing and in this instance a large one, the experience gained in it, and at the Allouez and the Ahmeek shafts, where the turn is in the direction of dip, shows what liberties can be taken with shafts if properly planned.

Designs and Methods of Sinking Shafts

In the conglomerate workings, several shafts with one manway and one hoisting compartment are used. These shafts are driven 12x9 ft. with two hoisting compartments. Shafts with two hoisting compartments and a manway are sunk 22x9 ft. in the South Hecla mine, while the subshafts in the Red Jacket lower workings are made 16x9 ft., because cars instead of skips are used in them. The standard size for a shaft with two hoisting compartments and a manway in the amygdaloids, is about 22x9 ft., the manway being 4 ft. wide.

In these flat-dipping shafts, it is an open question whether it is better to place the manway in the center or at one side. With the latter, only one row of dividers is necessary to carry the lining for the manway, while with the other, two rows of divider posts must be placed. Where the two skipways are side by side, a man working between doors in one of the skipways is permitted more leeway in getting out of danger; with the skipways one on each side of the manway, the roller-man can do the oiling of the rollers and inspect the tracks more easily and with less journeying along the tracks, than if the skip-tracks are both on the same side of the manway, in which case the roller-men must go down the tracks to inspect and oil the rollers on the far side. With the manway in the center, a skip, if it leaves the tracks, is less likely to interfere with the one on the other side and in case the shaft gives trouble due to heavy ground, there is less inconvenience in supporting the roof. This is so because more room is left for timbers or concrete bulkheads than if such support had to be squeezed into a restricted free space between the two skip-tracks. The work of putting in such timbering or concrete will also interfere less with hoisting when the manway is in the center.

Drilling in Shafts Done on Day Shift

The drilling in the shafts is almost universally confined to the day shift, while the mucking is done on night shifts. A center cut is generally used, to give a central sump, and as the amount of water in the shaft is small, it is generally handled by bailing. The sinking bucket is carried from the overhead trolley that travels along either a wire rope, hung from an eyebolt in the roof or else along an I-beam suspended by chains from plugs in the hanging. Two machines are used in a shaft and all holes are blasted each shift, so that on the next shift full advantage can be taken of the manner in which the ground is breaking. A rock pentice, 8 to 10 ft. thick and drilled so that it can be blasted out when desired, is left under the skip sump whenever the shaft is being sunk in a mine that is operating.

An advance of from 7 to 9 ft. per round is made according to the size of the shaft and the depth of the holes used. About 34 holes are required to break a 9x22-ft. shaft. The machine men that work in these shafts on day shift use the shaft machine in drifting on the lowest level upon going on night shift, so as to keep the machine busy while the shovelers are cleaning out the shaft. In sinking an advance of 45 to 50 ft. per month is made. The cost of sinking a 10x20-ft. shaft at the Mohawk mine is given in the following table:

AVERAGE SINKING COST FOR A 10x20-FT. SHAFT AT MOHAWK MINE IN 1909 AND 1910

	Per Ton of Rock Broken	Per Foot of Advance
Labor		
Machine men	$0.576	$10.05
Drill boys	0.027	
Hoisting and bucket landers	0.210	3.50
Supplies	0.116	1.94
Mucking (approximately)	0.210	3.50
Total, without timbering	$1.139	$18.99

The average number of tons broken per machine per day of two shifts, was 21.5 and the average wage of a machineman was $3.09 per shift.

Timbering the Shafts

In the conglomerate shafts the great weight of the hanging wall has caused the adoption of a novel method of supporting the roof whenever the weight of the hanging commences to come on. In this method, described in a shorter article, the weight of the roof is carried on posts and headboards, while shaft sets are placed merely to carry the lagging and to allow the shaft crew, when easing timbers, to work over the tracks without delay to the hoisting. In the amygdaloid shafts, only posts are required in all but the heavy ground, and generally these posts are carried only between the manway and the hoisting compartments. On account of the ties and the stringers that in the older amygdaloid shafts are of wood, as well as the lagging that is carried along the dividers, the timbers in both the amygdaloid and the conglomerate shafts are sprinkled frequently to guard against fire.

This sprinkling also has a tendency to lengthen the life of the timbers, which, even if good resinous pine, do not last more than seven or eight years at the most, in an upcast shaft. On the other hand, the dampness in the shaft that results from the sprinkling, tends to make the roof slab sooner. For doing the

sprinkling, a water pipe is carried down the shaft, broken generally every 500 ft. to ease the pressure. With a 50-ft. hose and by working up and down from a level, it is easy to sprinkle the timbers.

Fire Doors Used

As a further safeguard, in the conglomerate mines, substantial fire doors have been put in for several years on both sides of the shaft at each level, so that a fire can be shut off from the rest of the mine. It is beginning to be the custom also at the amygdaloid mines to put in fire doors on the different levels, as these doors can be used in winter to regulate the draft throughout the mine. The increasing use of concrete in the amygdaloid shafts, however, is rapidly making them more fireproof. Already it is the best practice to use concrete stringers for carrying the rails of the skip tracks in the amygdaloid shafts, while the Ahmeek shaft is timbered with concrete sets and concrete station floors are in use at the Ahmeek, Wolverine, Mohawk and South

No. 2 Mohawk Mine, Michigan

Kearsarge shafts, and even stations timbered with concrete sets are used at the Wolverine; in the Wolverine and Mohawk shafts, pillars of reinforced concrete are put in to hold up especially heavy parts of the hanging wall and the brows of ground undercut at the stations, because those shafts are sunk in the foot wall. It is almost a universal custom in the district to make the collar of the shaft of reinforced concrete, whether or not it is necessary to sink through quicksand, as the decrease in the pumping expense, due to the surface water that the tight collar keeps out of the shaft when the snow-drifts about the orehouse begin to melt, pays for the extra cost of the construction in a few years.

Concrete Stringers in Amygdaloid Shafts

The absence of any tendency in the foot wall to swell in the amygdaloid shafts makes it possible to use concrete stringers in them, and when a 60-lb. rail is also used, a permanent skiproad is obtained. Owing to the swelling of the foot wall in the conglomerate shaft, the skip tracks have to be laid with the rails resting directly upon cedar ties, placed about 18 in. apart. To guard against the skip jumping the track, 6x8-in. stringers are carried on the ties alongside the rails. The rail itself cannot be carried on a stringer, as it would be impossible to work on the swelling ground under such a stringer without interfering with hoisting; with the rails carried directly upon the ties, it is an easy matter whenever the swelling of the foot throws the track out a little, to work out the ground from under one of the ties and replace it without interfering with hoisting in the least.

Good, strong shaft pillars are now characteristic of the practice in the mines, although in the past small pillars were left at some of the shafts, especially where the shaft is in the foot wall. In the upper workings of the conglomerate mines, the pillars were only 75 ft. wide on each side of the shaft, but this was increased with depth to 85 ft. and finally below a depth of 5000 ft. on the lode to 100 ft. As the amygdaloid ore is much stronger than the conglomerate in resisting pressure, the pillars at first were not left more than 50 ft. wide in these shafts, but these pillars are now also cut 100 ft. wide on each side of the shaft. Robbing of the shaft pillars has already commenced at some of the conglomerate shafts and no great difficulty is being encountered in getting the ore out, except that the roof is rather heavy. The walls of the lode close in in a few weeks after the ore in the shaft pillars has been taken out.

Hoisting Speed

At the Red Jacket shaft the attraction is the Whiting hoists. There are in existence only two of these hoists in this country, both at the Red Jacket shaft, and another at the DeBeers diamond mine in South Africa. A tail rope is used and of course the system is best adapted to vertical shafts; a mine must be quite deep to make the use of such a hoist profitable. Like other tail-rope systems, it is less flexible than a double-drum hoist working in balance. A recent accident also shows that the strength of the tail rope is almost as important as that of the hoisting rope. If the tail rope breaks, an accident is likely to result owing to the sudden reduction of the load on the side on which the rope breaks, while on the other side a greatly increased strain is suddenly put upon the hoisting rope and engine.

The most popular hoist for hauling from considerable depth on the incline at the amygdaloid mines is a Nordberg with conical ends on the drum. The two ropes are wound on it in opposite directions, using the central cylindrical portion in common. These cones have a small diameter of 12½ ft., and a large diameter of 18½. In the vertical shafts a speed of 2500 ft. per min. and more is used in hoisting rock, while in handling men a speed as great as 1200 ft. per min. is employed. In the inclines a speed of 1000 ft. per min. is used in handling the men, and in hoisting rock the speed depends upon the depth. With a shaft only 3000 ft. deep on the incline, a speed of about 1700 ft. per min. is used, as with that speed the hoisting can be done without any danger of the skips jumping the track. From the deeper inclines on the conglomerate, a speed of 2250 ft. per min. has to be employed in hoisting rock, and at times both at the amygdaloid and the conglomerate shaft a speed of 3500 ft. per min. is attained. While these speeds may seem high to some, they are not dangerous because of the large drums used on the hoisting engines; the larger the drum diameter, the higher the speed at which hoisting can be done safely.

Self-Dumping Skips Used

All hoisting from inclines is done in self-dumping skips. Those at the Calumet & Hecla mines have a capacity of 7½ tons, and most of the other companies use as large a skip, although in some instances one holding only two cars, or from 4½ to 5 tons is used. The signaling is done almost universally by a bell cord, using a lever on the rope that can be locked down by the man under whose control the skip is at the time. At the Ahmeek and a few of the other mines, a solenoid electric signaling system is used, while at the Wolverine the Johnston system of vibrating bell signal is employed. Both systems are well liked at the mines where they are used, and it seems as if it would pay to use electric signals in more of the shafts. One of the curiosities of the copper country is the hoisting of the ore in cars at the Tamarack shafts. Double-decked cages are used, and the cars hold about

2.7 tons of ore as loaded. The men slough these around on the station turnplates with surprising dexterity as long as the car is kept in motion. The turnplates are of cast iron, 1½ in. thick, and rest on stringers.

Types of Tram Cars

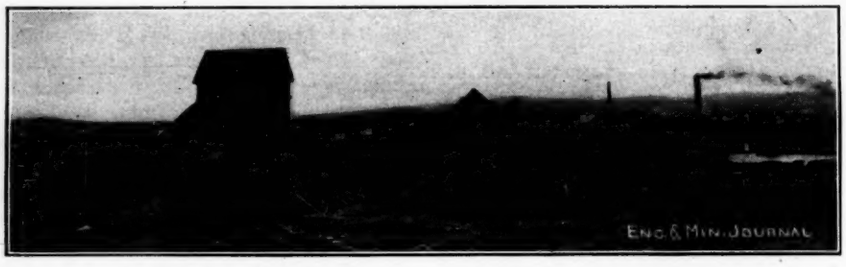
The cars used underground in the northern mines of the Lake district are all low, and characteristically have the front end open, to allow boulders to be lifted into them. The front axle is bolted fast to the car body, while the rear axle is held to the other axle by two distance straps, which give the cars a wheel-base of 24 in. These wheels are placed so that the front axle is only slightly ahead of the center of gravity of the car. This makes the car easy to dump at the shaft, but a drawback is, that with such a long body and short wheel-base, any unequal loading of the car is likely to put it in such balance that only a small obstruction will throw it from the track.

Another object in making the cars so low, most of them having side sections not more than 30 in. above the track, is to decrease the labor of shoveling. For these reasons the cars are well designed for use in the Lake mines. The cars generally have their wheels held on by keys and only on the cars used at the Tamarack, where the wheels are cast with an oil well in them, and those used at the Red Jacket shaft, where the grease is supplied to the wheel from a screw grease cup that fits on the hollow axle at the ends, is any provision made for automatic oiling. As a result the wheels have to be removed and the axles daubed with grease. For this reason the cars are not well oiled and roll harder than they should, as is shown by the fact that the grade of the drifts has been increased from 6 in. to 8, and finally 10 in. per 100 feet.

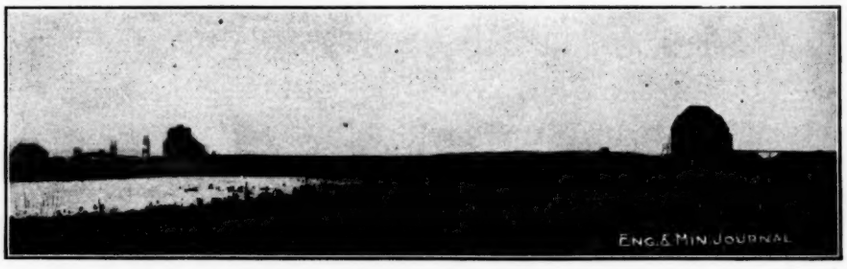
The cars used in the Red Jacket workings of the Calumet & Hecla company, have solid boxes with the wheels carried on hubs fastened to the sides and bottom of the car. This is necessary in order to permit the car to be brought into the mine and yet hold 2½ tons when loaded. These are dumped at the ore pockets with air plungers and a chain with a hook on it. The cars in the conglomerate mines that are worked through inclines, have swinging doors at both ends. The door on the front, or dumping end, swings up, while the one at the rear end swings down, to allow large boulders to be rolled into the car without trouble. This use of a door on the car seems to be better practice than to have only one end and that closed permanently, for it is important in loading cars where hand tramming is used, that they be kept full if the cost of shoveling and tramming is to be kept low. If the ore is held in the cars by a wall of boulders piled in the front end, it gives the men a good chance to cheat a little in the loading, by building the wall with a good slant to it or by starting the wall a little back from the end of the car.

There is no standard gage for tracks in the district. In the Mohawk and Wolverine mines the gage is 3 ft. 1 in.; North and South Kearsarge, Allouez and Ahmeek, 3 ft. 4 in. and in the Calumet & Hecla, 4 ft. A 4-ft. gage is all right for a straight track such as generally obtains in the conglomerate workings and where mechanical haulage is used, but when the track is crooked, it is too wide a gage, as it is hard for a man to push the car around a curve. The present management of the company did not, however, use this 4-ft. gage out of choice, in the Osceola amygdaloid workings; it was necessary to retain this gage on reopening the mine, as the drifts had been driven with that gage and cars with that gage were at hand. The question of gage is simply a problem of railroading; wide gage for straight tracks, and narrow gage for crooked roads. With a wide car, the sides can be made lower and the length shorter to hold a given tonnage, and with the same wheel-base the car will leave the track less easily; however, probably a gage of 3 ft. is wide enough for any car that men are expected to tram.

To facilitate the loading of the skips it is generally the practice in the case of shafts having two hoisting compartments, to use a spur track coming up to the shaft on one side so that one car may be kept standing on the side track waiting to be dumped over the side of the skip; the main track extends across the shaft on the hanging-wall side and has two turntables, one in front of the center of each hoisting compartment, with a short piece of track to take the cars from the table to the edge of the plat so that they can be dumped to full advantage into the skip. The custom is to dump the side cars first, as the ore, having a velocity toward the bottom of the skip, goes clear to the bottom. With shafts having a dip of about 38° this is an important thing in dumping the first car. The second and third cars are dumped in from behind. Two men do the actual dumping, and a third trims the load, assisted by one of the men that aided in the dumping. In the conglomerate workings, where mine requirements approach closely to the hoisting capacities of the shafts, the three cars making the skip load are dumped in 1¼ minutes. Aprons are used to bridge the gap between the plat and the skip, thus preventing any ore from being spilled into the shaft. As a dip of 38° is rather a flat slope for loading skips, an increase of 2 or 3° is obtained in the slope of the skip bottom, where necessary, by placing the front wheels of the skip on an axle bolted to the under side of the skip, to raise the front end as far above the tracks as is practical.



South Kearsarge Shafts—Central Boiler Plant



Mohawk Nos. 1 and 2 Mines—Also Served by One Boiler Plant

System of Loading and Dumping

The loading of the skips is done in several ways. It is in this part of the tramming that much time is lost at many of the mines. One method is to have the trammers do their own dumping, but this results in loss of time, since the men must wait before they can get a skip at their level. Another way is to have the dumping done only by a special crew of dumpers. This necessitates having a

number of extra cars on the level, but this is a small drawback and it is a better and safer method than the first, for anyone can ring the bell when the bell rope is not locked down; this precaution is resorted to when the skip is busy hoisting from a level. In dumping in this way it is necessary for the dumpers to ride on the skips from the bottom of the shaft to the top level, in order to begin the circuit again.

At some mines this practice of riding on the skips is condemned because of the danger, and probably rightly so. These dumpers begin to shovel on the upper level until a sufficient number of cars have been loaded to make two skip loads. Then they dump their own cars and go down from level to level, dumping the cars in turn. After the dumping is finished the men begin tramming again on the bottom level. When six more cars have been loaded, a second crew of three dumpers starts down on the second trip, and then later the third crew starts. By that time it is noon, and the men get on the man car which has been put on the rope in one compartment, and ride back to the top level, to begin to dump again in the same manner in the afternoon. A third system is to have a crew of dumpers, always three in number in all the systems, go through from top to bottom, dumping the cars, and then ride to the top again. However, instead of their having control of the skip, the latter is signaled away from or to the levels by a man centrally situated in the mine. As soon as the skip is ready the dumpers signal to him and he signals the hoisting engineer.

With this system, which requires either the use of a regular telephone or a speaking tube arrangement of some sort, in case a trammer on any level needs the skip he telephones the man in charge of the signaling, and the skip is sent to him as soon as possible. It is possible in this way to avoid long waits that are apt to occur when upsetting of a car delays tramming, or when the men shoveling and tramming from a drift stope get behind in their loading on one of the development levels. This last system of dumping appears to be the best, provided that the saner plan is not followed, of sending the ore from several levels to one of the lower ones, so that tramming can be concentrated sufficiently to pay for mechanical haulage and the use of skip chutes and measuring pockets, or merely measuring pockets in the case of heavy ground.

(To be continued)

Zirconiferous sandstones have been found on numerous farms near Ashland, Va., says a U. S. Geological Survey bulletin.

Adinau Safety Powder

SAN FRANCISCO CORRESPONDENCE

The action of Adinau safety powder, called "Adinite," as used in quarry practice was recently demonstrated at Hutchinson macadam quarry in Contra Costa County, near Oakland, Calif. The test was made by the foreman and other employees of the quarry, and neither the inventor of the powder nor others interested had any part in the selection of the rock or the drilling or blasting.

Four 6-ft. holes were drilled in the open face of the quarry about 50 ft. above the floor and 20 ft. below the surface of the deposit. Three unattached boulders were also selected, one of which was drilled with one 3-ft. hole; the two others were bulldozed. Thirty-five sticks of powder were used, distributed at the rate of one stick to each 1-ft. of depth of hole; three sticks to one bulldoze; five sticks to the other. The boulder which contained the 3-ft. hole weighed approximately 7 tons; the others about 3 tons and 5 tons. Ordinary caps and fuse were used.

The seven explosions followed in brief and regular order, beginning with the blasts in the face of the quarry and ending with the largest boulder; the detonations were sharp and short like the crack of a gun. The rock in the face of the quarry was broken small, the exposed fragments slid down gradually, none being carried or shot away upward or outward any appreciable distance. The pitch of the face was about 85°. The bulldozed boulders were well shattered, the fragments being scattered within close range and not lifted. The smaller one was not completely shattered, but was peeled close and left a core about one-fifth the whole rock. The large boulder, which was blasted, gave the most interesting result. The hole was drilled on top in about the center and into a crack or seam. The rock was split by the blast along the line or track of the seam; about six-sevenths of the whole rock falling apart well shattered but not scattered, the remaining one-seventh being moved several inches from its original position and apparently remaining intact. The larger portion of the mass was lifted a few inches above the floor and fell into fragments as though it were mechanically constructed in parts and mechanically unfolded. The area covered by the shattered parts was no greater than would have been occupied had they been placed by hand in an irregular pile. There was no shooting of the rocks into the air. The smaller part of this boulder weighing probably one ton was moved a few inches from its original position, and though apparently remaining intact was in fact well cracked and could be easily broken to required sizes for the gyratory crushers by sharp blows with hand hammers. The general result of the blasting and bulldozing was the breaking of the rock to sizes varying from four to 10 inches.

Various experiments testing the safety of the powder were made with sticks picked at random by some of the visitors prior to loading the holes for blasting. Safety against fire was proven by the use of the red-hot iron rod run through a stick of the powder and further by placing a stick of the powder in a blazing fire. Safety against impact was tested by Professor Adinau hammering the powder drawn from a stick and also hammering the stick powder itself on a blacksmith's anvil. Another stick was struck by a shot from a revolver, without exploding. Evidence that the powder will not explode except in confinement was sufficient. One of the main objects of the company is to provide a product which can be used instead of dynamite by miners, without change in the process of handling the explosive or in the way of drilling holes. Adinite is of the same size and shape as dynamite or the ordinary blasting powder.

The powder used in this demonstration, Professor Adinau explained, was not intended to insure against the particular danger of damp fire. He claims to have for use in mines, a special formula which reduces to a minimum, the danger of explosion by damp fire. It is claimed also by Professor Adinau, that freezing has no effect whatever on this powder because it is made exclusively of ingredients which are solid at the ordinary temperature, so that it can not be disturbed by any lower temperature.

This powder is being introduced and will be manufactured by the Adinau Safety Powder Co. with head office in Mills Building, San Francisco. The company operates a small plant at San Mateo, Calif., for the manufacture of powder for demonstration purposes. The manufacture of commercial powder has not yet been undertaken, but is contemplated when the work of organization is completed.

New Zealand Mineral Production

The official figures for New Zealand's mineral production for 1910 are as follows, arranged in order of descending value: Gold, 478,288 oz.; coal, 2,197,362 tons; kauri gum, 8693 tons; silver, 1,711,235 oz. The value of the above items is estimated at £3,752,696; the value of all unenumerated items is £22,202. From 1853 to 1910, inclusive, New Zealand has produced 19,709,762 oz. of gold, 14,695,797 oz. of silver, and 306,500 tons of kauri gum.

Mining and Metallurgical Patents

A Classified List of New Inventions

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by "The Engineering and Mining Journal" upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COPPER

BRASS SUBSTITUTE—Composition of Matter. Louis Gross, Homestead, Penn., assignor to Car Gross, McKees Rocks, Penn. (U. S. No. 1,023,642; Apr. 16, 1912.)

LEACHING—Method of Treating Copper-Bearing Substances. C. S. Bradley, New York. (Brit. No. 12,304 of 1911.)

PURIFICATION AND DEOXIDATION of Copper by Boron. Ezechiel Weintraub, Lynn, Mass., assignor to General Electric Co. (U. S. No. 1,023,604; Apr. 16, 1912.)

REFINING COPPER. Walter S. Rochey and Hilliary Eldridge, New York, N. Y., assignors to Metallurgical Research Co. (U. S. No. 1,027,769; May 28, 1912.)

GOLD AND SILVER

AMALGAMATOR. William James Gruss and Max R. McColloms, Ramsey, Nev. (U. S. No. 1,032,332; July 9, 1912.)

AMALGAMATOR—Separator and Amalgamator. John Wick, Council, Alaska. (U. S. No. 1,027,952; May 28, 1912.)

ANTIMONIAL AND ARSENICAL ORES—Improved Process for the Recovery of Gold and Silver from Antimonial, Arsenical and other Gold Bearing Ores. J. Gitsham, Moonee Ponds, Australia. (Brit. No. 13,621 of 1911.)

CYANIDING—Process of Precipitating and Recovering Metals from Cyanide Solutions Containing Same. C. W. Merrill, Berkeley, Calif. (Brit. No. 7602 of 1911.)

CYANIDING—Pulp-Agitator. William Hammond Iron Works, Warren, Penn. (U. S. No. 1,026,578; May 14, 1912.)

DREDGE—Suction Dredger. Erastus E. Roberson, Le Grand, Cal., assignor of two-thirds to William A. Huelsdonk, Le Grand, Cal. (U. S. No. 1,028,387, June 4, 1912.)

DREDGING—Suction Tube for Hydraulic Dredging Machines. Louis J. Baltz, Buffalo, N. Y. (U. S. No. 1,027,095; May 21, 1912.)

DRY-PLACER SEPARATOR and Concentrator. Newton C. Westerfield, Chicago, Ill., assignor to International Manufacturing & Mining Co. (U. S. No. 1,029,651; June 18, 1912.)

FILTER APPARATUS. Bruce W. Traylor, New York, N. Y. (U. S. No. 1,029,155; June 11, 1912.)

GOLD-SAVING MACHINE. James McDonald Wishart, Pasadena, Cal. (U. S. No. 1,030, 499; June 25, 1912.)

LAUNDERS—Improved System of Overflow Launders for Tanks Used in the Process of Gold Recovery or Extraction from Ores. W. Ross, Johannesburg, South Africa. (Brit. No. 13,433 of 1911.)

PLACER MINING—Black-Sand and Gold-Saving Machine and Undercurrent. Charles J. Evans. (U. S. No. 1,032,746; July 16, 1912.)

RECOVERY—Apparatus for the Recovery of Precious Metals. Henry Noel Potter, Hollywood, Cal. (U. S. No. 1,030,490; June 25, 1912.)

WASH-SOLUTION COLLECTOR. Frank Gardner Peck, Colorado Springs, Colo. (U. S. No. 1,030,918; July 2, 1912.)

IRON AND STEEL

BLAST-FURNACE TOP. George Hampton Smith, Aspinwall, Penn. (U. S. No. 1,031,478; July 2, 1912.)

BLAST FURNACES—Method of Charging Blast Furnaces. H. Aumund, Danzig-Langfuhr, Germany. (Brit. No. 20,375 of 1911.)

CEMENTATION—Improvements in Cementation Furnaces. Soc. Anon. Italiana Giov. Ansaldo. Armstrong & Co., Genoa, Italy. (Brit. No. 24,635 of 1911.)

CHARGING FURNACES. Frank C. Roberts, Wynnewood, Penn. (U. S. No. 1,033,036; July 16, 1912.)

CONVERTER—Apparatus for the Production of Steel. Henry Johnson, Sheffield, England, assignor to Verdon Cutts & Hoult, Sheffield, England. (U. S. No. 1,032,217; July 9, 1912.)

CRUCIBLE FURNACE. David Reisinger Steele, Curtis Bay, Md., assignor to Harry D. Harvey, Baltimore, Md. (U. S. No. 1,029,090; June 11, 1912.)

CUPOLAS—Breast-Wall Brick for Cupolas. Robert P. Cunningham, Holyoke, Mass. (U.S. No. 1,027,821; May 28, 1912.)

ELECTRIC STEEL—Improvements in the Manufacture of Electric Steel. Victor Stobie, Sheffield, Eng. (Brit. No. 17,179 of 1911.)

FURNACE COVER. Charles S. Robinson, Youngstown, Ohio. (U. S. No. 1,029,319; June 11, 1912.)

FURNACE GAS VALVE. Mark W. Johnson, Jr., Ensley, Ala., assignor of one-half to Karl Landgrebe, Ensley, Ala. (U. S. No. 1,024,785; Apr. 30, 1912.)

FURNACE-TOP. Frank C. Roberts, Wynnewood, Penn. (U. S. Nos. 1,033,034 and 1,033,035; July 16, 1912.)

GAS CLEANING—Dry Cleaner for Gas. Mark W. Johnson, Jr., Birmingham, Ala. (U. S. No. 1,024, 784; Apr. 30, 1912.)

HEATING FURNACE—Continuous Heating Furnace. Asa W. Griffith, Youngstown, Ohio. (U. S. No. 1,029,605; June 18, 1912.)

HOT-BLAST STOVE for Heating Air, Steam, or Other Gases, and Brick Therefor. Frank C. Roberts, Wynnewood, Penn. (U. S. No. 1,032,505; July 16, 1912.)

MANUFACTURE—Improvements in or Relating to the Production of High-Grade Steel and Slag Rich in Soluble Phosphates. Deutsch-Luxemburgische Bergwerks- und Hütten-Aktiengesellschaft, Bochum, Germany, and Albert Vogler, Dortmund, Germany. (Brit. Nos. 19,640 and 27,400 of 1911.)

MANUFACTURE—Method of Manufacturing Steel. Herman A. Brassert, Braddock, Penn. (U. S. Nos. 1,032,653, and 1,032,655; July 16, 1912.)

ORE REDUCTION—Method of Reducing Iron Ore. Gustaf Grondal, Djursholm, Sweden. (U. S. No. 1,033,051, July 16, 1912.)

REDUCTION OF ORES. Elihu Thomson, Swampscott, Mass., assignor to General Electric Co. (U. S. No. 1,031, 490; July 2, 1912.)

REFINING—Open-Hearth Process of Refining Steel. Gaston Barbanson and Max Lepersonne, Brussels, Belgium. (U. S. No. 1,030,152; June 18, 1912.)

SCRAP—Process of Balling Scrap. Morris Sellers and Hal M. Nicholls, Chicago, Ill. (U. S. No. 1,029,235; June 11, 1912.)

SINTERING—Method of Sintering Fine Ores and Similar Materials. James G. West, Jr., Wilkinsburg, Penn. (U. S. No. 1,031,153; July 2, 1912.)

SMELTING FURANCE. George P. Gibson, Braddock, Penn. (U. S. No. 1,032,599; July 16, 1912.)

STEEL METAL Containing Titanium and Manganese. Auguste J. Rossi, Niagara Falls, N. Y., assignor to Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,029,637; June 18, 1912.)

TREATING ORES. Edward Kerr, Pittsburgh, Penn. (U. S. No. 1,032,007; July 9, 1912.)

LEAD, ZINC AND OTHER METALS

ALUMINUM—Compound for Use in Soldering Aluminum and Process of Forming Same. John J. Natzman, Detroit, Mich. (U. S. No. 1,032,494; July 16, 1912.)

ALUMINUM—Process for Direct Nickeling of Aluminum or Alloys Containing Aluminium. Marc Chirade and Joseph Canac, Paris, France. (U. S. No. 1,030,972; July 2, 1912.)

LEAD—Process for Obtaining Refined Lead from Scrap. Julius Asbeck, Krantscheid-Westerwald, Germany. (U. S. No. 1,025,956; May 14, 1912.)

LEAD PIGMENTS—Apparatus for the Production of Lead Pigments. John W. Bailey, New York, N. Y., assignor to International Lead Co. (U. S. No. 1,031,160; July 2, 1912.)

SULPHIDE ORE TREATMENT—Improvements in the Treatment of Sulphide Ores for the Removal of Sulphur Therefrom and the Production of Sublimed White Lead and Oxide of Zinc. E. E. Banes, Strathfield, N. S. W. (Brit. No. 13,988 of 1911.)

TIN—Apparatus for Smelting Metals, more particularly for the Production of Tin from Tin Ores. H. T. Hoveler, Surrey, Eng. (Brit. No. 23,117 of 1911.)

TIN—Method of Producing Chlorides of Tin. Robert J. McNitt, Niagara Falls, N. Y., assignor to Chlorine Products Co., New York, N. Y. (U. S. No. 1,030, 110; June 18 ,1912.)

TIN-OXIDIZING FURNACE. Konstantin von Olszewski, Dresden, Germany. (U. S. No. 1,028,595; June 4, 1912.)

TITANIUM—Article Composed Essentially of Titanium and Silver and Method of Producing the Same Auguste J. Rossi, Niagara Falls, N. Y., assignor to The Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,025,426; May 7, 1912.)

ZINC—Improvements in Furnaces for Extracting Volatile Metals from Their Ores. A. Zavelberg, Hohenlohehutte, Germany. (Brit. No. 16,821 of 1911.)

ZINC—Improvements in or Relating to the Metallurgy of Zinc. C. V. Thierry, Paris, France. (Brit. Nos. 20,913 and 21,014 of 1911.)

ZINC—Metallurgy of Zinc. C. V. Thierry, Paris-France. (U. S. Nos. 1,030,349, 1,030,350, and 1,030,, 351; June 25, 1912.)

ZINC—Process of Treating Zinc-Bearing Ore. James O. Johnstone, Buffalo, N. Y. (U. S. No. 1,029,932; June 18, 1912.)

ZINC ALLOYS—Improvements in or Relating to Alloys of Zinc. T. A. Bayliss, Warwick, and B. G. Clark, London, Eng. (Brit. No. 12,457 of 1911.)

ZINC DISTILLATION. John Collett Moulden and Harold Wolstan Webster, Seaton Carew, England, assignors to Central Zinc Co., Ltd., Seaton Carew, England. (U. S. No. 1,030,676; June 25, 1912.)

NON-METALLIC MINERALS

ASBESTOS—Purification of Asbestos. The British Thomson-Houston Co., Ltd. London, England. (Brit. No. 16,960 of 1911.)

ASBESTOS—Purification of Asbestos. Willis R. Whitney, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,031,498; July 2, 1912.)

CLAY—Machine for Cleaning and Sorting Clay or the Like. Michael Bohn, Nagykikinda, Austria-Hungary. (U. S. No. 1,031,823; July 9, 1912.)

CLAY—Preparation of China-Clay. Alfred Gordon Salamon, London, and Charles Jeens Grace, Steyning, England, assignors to The Exploration Co., Ltd., London. (U. S. No. 1,032,862; July 16, 1912.)

FELDSPAR—Process for the Recovery of Silica, Alumina, and Potash from Feldspar. Samuel Peacock, Baltimore, Md., assignor to American Acid Co., Baltimore, Md. (U. S. No. 1,030,122; June 18, 1912.)

MAGNESIA—Manufacture of Magnesia. Emanuel G. Zies, Baltimore, Md., assignor to Standard Lime & Stone Co., Baltimore, Md. (U. S. No. 1,031,502; July 2, 1912.)

PETROLEUM—Utilizing Acid Sludge from Refining Petroleum. John C. Black and Marvin L. Chappell, Richmond, Cal., assignors to Standard Oil Co., Richmond, Cal. (U. S. No. 1,031,413; July 2, 1912.)

MINING—GENERAL

AERIAL TRAMWAYS—Hauling-Rope Grip for Rope Railways. Fritz Dohle, Leipzig, Germany, assignor to Adolf Bleichert & Co., Leipzig-Gohlis, Germany. (U. S. No. 1,031,328; July 2, 1912.)

BELT CONVEYORS—Discharging Apparatus for Belt Conveyors. Thomas A. Edison, Llewellyn Park, Orange, N. J. (U. S. No. 13,434, reissue; June 25, 1912.)

BLASTING—Detonating Composition. Ernest Goodwin, Stamford Hill, London, England, assignor to Eley Brothers Ltd., Edmonton, London, England. (U. S. No. 1,029,287; June 11, 1912.)

BLASTING—Method of and Apparatus for Charging Powder. William H. Plummer and John Tresider, Coleraine, Minn. (U. S. No. 1,029,630; June 18, 1912.)

CAISSON. Ralph H. Chambers, New York, N. Y., assignor to The Foundation Co. (U. S. No. 1,026,656; May 21, 1912.)

CONVEYOR for Use in Mines. Frank Billings, Cleveland, Ohio. (U. S. No. 1,030,226; June 18, 1912.)

DRILL—Rock Drill. David C. Demarest, San Francisco, Cal. (U. S. No. 1,029,855; June 18, 1912.)

DRILL—Rock Drill. James Miners Holman and John Leonard Holman, Camborne, England. (U. S. No. 1,029,294; June 11, 1912.)

DRILL CASINGS—Pulling-Stand for Drill Casings. Albert C. Ludlum, New York, N. Y., assignor to New York Engineering Co. (U. S. No. 1,027,867; May 28, 1912.)

DRILLING—Improvements in and Connected with Rock-Drilling and Like Apparatus. J. Kubat, Kladno, Bohemia. (Brit. No. 24,553 of 1911.)

DRILLING—Improvements in Chucks for Rock-Drilling Apparatus. J. M. and J. L. Holman, Camborne, Cornwall, Eng. (Brit. No. 24,635 of 1911.)

DRILLING—Improvements in Chucks or Tool Holders for Rock-Drilling Machines. J. Ferguson, High Wycombe, Eng. and E. J. Rule, Redruth, Eng. (Brit. No. 15,153 of 1911.)

DRILLING MACHINE—Universal-Joint Coupling for Drilling Machines. John Prue Karns, Boulder, Colo. (U. S. No. 1,030,663; June 25, 1912.)

DRILLS—Automatic Throttle-Valve-Locking Mechanism for Pneumatic Tools. Reinhold A. Norling, Aurora, Ill., assignor to Aurora Automatic Machinery Co., Aurora, Ill. (U. S. No. 1,027,061; May 21, 1912.)

DRILLS—Improvements in and Relating to Rock Drills and the Like. P. Williams, Bedwas, Eng. (Brit. No. 28,385 of 1911.)

DRILLS—Improvements in Valve Motions for Rock Drills. Ingersoll-Rand Co., New York. (Brit. No. 12,440 of 1911.)

DRILLS—Improvements Relating to Pneumatic Supporting and Feeding Apparatus for Rock Drills. G. Rayner and Percy Rayner. Sheffield, Eng. (Brit. No. 26,603 of 1911.)

DUMP CAR. Frank S. Ingoldsby, St. Louis, Mo., assignor to Ingoldsby Automatic Car Co., St. Louis, Mo. (U. S. Nos. 1,027,849; 1,027,850, and 1,027,851; May 28, 1912—No. 1,028, 116; June 4, 1912—No. 1,-028,882; June 11, 1912.)

DUMP CAR. Joseph R. Bowling, St. Louis, Mo., assignor to Ingoldsby Automatic Car Co., St. Louis, Mo. (U. S. No. 1,027,809; May 28, 1912.)

DUMP CARS—Door Mechanism for Side-Dump Cars. Karl H. Hansen, Pittsburgh, Penn., assignor to Orenstein-Arthur Koppel Co. (U. S. No. 1,031,-067; July 2, 1912.)

EXCAVATING MACHINE. Martin C. Hanson, Brager, Minn. (U. S. No. 1,031,788; July 9, 1912.)

EXCAVATING SCOOP for Wire-Rope Haul. Archibald McGillis, Vancouver, B. C. (U. S. No. 1,027,876; May 28, 1912.)

EXCAVATION—Drag-Bucket. Gurdon H. Williams, Cleveland, Ohio, assignor to G. H. Williams Co., Cleveland, Ohio. (U. S. No. 1,027,301; May 21, 1912.)

EXCAVATION—Rock-Gathering and Excavating Machine. David A. Gilchrist, Belgrade, Mont. (U. S. No. 1,029,359; June 11, 1912.)

EXCAVATOR. Thomas G. Travers, Iron Ridge, Wis. (U. S. No. 1,031,402; July 2, 1912.)

EXCAVATOR—Bucket Mechanism. Charles A. Frayer, Toldeo, Ohio, assignor, by mesne assignments, to Bucyrus Co., South Milwaukee, Wis. (U. S. No. 1,032,358; July 9, 1912.)

FAN. Ernest E. Blackmer and Eric W. Johnson, Monongahela, Penn. (U. S. No. 1,030,561; June 25, 1912.)

FLUME. Charles H. Ramsden, San Francisco, Cal., assignor to Western Pipe Steel Co. of California. (U. S. No. 1,027,627; May 28, 1912.)

FLUME—Metal Flume or Conduit. Harold S. Williams, Caldwell, Ida. (U. S. No. 1,031,407; July 2, 1912.)

FLUME—Trough or Open Flume. William Lennon, Manitou, Colo. (U. S. No. 1,026,957; May 21, 1912.)

HOISTING—Mine or Lift Cage Safety Gripping Apparatus. Louis Sidney Rayner, Caergwrle, England. (U. S. No. 1,031, 819; July 9, 1912.)

HOISTING—Safety Apparatus for Mining Cages, Lifts, and the Like. Charles H. Sivel, Weston, Newark, England. (U. S. No. 1,032,710; July 16, 1912.)

HOISTING—Winding-Engine for Collieries or Like Purposes. Robert James Worth, Stockton-on-Tees, England. (U. S. No. 1,029,410; June 11, 1912.)

HYDRAULIC AIR COMPRESSOR or Pump. Otto H. Mueller, Camberwell, England, assignor to Henry R. Worthington. (U. S. No. 1,031,143; July 2, 1912.)

INSULATOR—Mine Insulator. Frederic A. Warren, Canon City, Colo. (U. S. No. 1,031, 975; July 9, 1912.)

LAMP—Miner's Lamp. Frank L. Flynn, Wilkes-Barre, Penn. (U. S. No. 1,032,130; July 9, 1912.)

LAMP—Miner's Lamp. Nelson Plount, New York, N. Y. (U. S. No. ,1026,622; May 14, 1912.)

LAMPS—An Improved Igniting Device for Miners' and Like Safety Lamps. A. Pasierbski, Mikultschutz, Germany. (Brit. No. 19,785 of 1911.)

LAMPS—Apparatus for Igniting Miners' Lamps. Ernest Arthur Hailwood, Morley, near Leeds, England. (U. S. No. 1,030,297: June 25, 1912.)

MUCK SHOVEL. Norman Ebbley, Wallace, Ida. (U. S. No. 1,029,799; June 18, 1912.)

PICK Specially Adapted for Miners' Use. W. E. Jones, Abersycham, Eng. (Brit. No. 2966 of 1912.)

PUMPING—Method of Operating Internal-Combustion Pumps. Henry M. Chance and Thomas M. Chance, Philadelphia, Penn. (U. S. No. 1,026,639; May 14, 1912.)

PUMPING—Method of Operating Reciprocating Pumps. Henry M. Chance and Thomas M. Chance, Philadelphia, Penn. (U. S. No. 1,026,638; May 14, 1912.)

PUMPING—Method for Pumping Liquids. Henry M. Chance and Thomas M. Chance, Philadelphia, Penn. (U. S. No. 1,032,114; July 9, 1912.)

PUMPS—Method of Regulating Pumps of Certain Types for the Pumping of Liquids. Henry M. Chance and Thomas M. Chance, Philadelphia, Penn. (U. S. No. 1,032,113; July 9, 1912.)

SLUICE GATE. William van den Heuvel, Los Angeles, Cal. (U. S. No. 1,028,640; June 4, 1912.)

SURVEYING INSTRUMENT. George H. Stone, Colorado Springs, Colo. (U. S. No. 1,032,-437; July 16, 1912.)

TIMBER PRESERVATION—Process of Preserving Wood. Carleton Ellis, Montclair, N. J., assignor to Copper Oil Products Co., New York. (U. S. No. 1,028,201; June 4, 1912.)

TUNNELING—Method of Boring Tunnels. Norman Ebbley, Wallace, Ida. (U. S. No. 1,032,049; July 9, 1912.)

TUNNELING MACHINE. Richard T. Stone, Deming, N. M. (U. S. No. 1,026,412; May 14, 1912.)

WIRE-ROPE CLAMP. Wallace E. Belcher, Chicago, Ill. (U. S. Nol 1,027,234; May 21, 1912.)

ORE DRESSING—GENERAL

CONCENTRATOR. Walter L. Hawley, Cartersville, Mont. (U. S. No. 1,032,281; July 9, 1912.)

CONCENTRATOR—Belt Concentrator. Joseph W. Pinder, Oakland, Cal. (U. S. No. 1,030,427; June 25, 1912.)

CONCENTRATOR—Mineral Concentrator. Charles O. Michaelsen, Omaha, Neb. (U. S. No. 1,-027,349; May 21, 1912.)

CONCENTRATOR—Ore Concentrator. Carl J. Witt, Needles, Cal. (U. S. No. 1,023,909; Apr. 23, 1912.)

CONCENTRATOR—Ore-Concentrator. Laban E. Jones, Anaconda, Mont. (U. S. No. 1,029,933; June 18, 1912.)

CRUSHER. Ray C. Newhouse, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,031, 083; July 2, 1912.)

CRUSHER. William H. Lieber, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,030,194; June 18, 1912.)

CRUSHER—Gyratory Crusher. Thomas W. Capen, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,029,742; June 18, 1912.)

CRUSHER—Jaw Crusher. Albert B. Black, Concord, Mass., and James H. McKee, Harvey, Ill., assignors to Austin Manufacturing Co., Chicago, Ill. (U. S. No. 1,032,808; July 16, 1912.)

CRUSHER or Pulverizer. Milton J. Williams, Chicago, Ill. (U. S. No. 1,030,956; July 2, 1912.)

CRUSHING—Chilian Mill. Stephen H. Pitkin and James H. Stratton, Cleveland, Ohio, assignors to Wellman-Seaver,-Morgan Co., Cleveland, Ohio. (U. S. No. 1,031,730; July 9, 1912.)

CRUSHING—Crusher Head for Grinding Mills. Edward S. Black, Chicago, Ill., assignor to Edgar Allen American Manganese Steel Co., Augusta, Me. (U. S. No. 1,028,530; June 4, 1912.)

CRUSHING—Grinding Mill. William R. Cunningham, Bucyrus, Ohio, assignor to American Clay Machinery Co., Bucyrus, Ohio. (U. S. No. 1,028,-550, June 4, 1912.)

CRUSHING—Lifting Mechanism for Mullers of Ore-Grinding Pans. Gustave A. Gelien, San Francisco, Cal. (U. S. No. 1,029, 863; June 18, 1912.)

CRUSHING MILL. Thomas Leggett Sturtevant; Quincy, and Thomas Joseph Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co. (U. S. No. 1,027,294; May 21, 1912.)

HYDRAULIC CONCENTRATOR. Ulysses A. Garred, Anaconda, Mont. (U. S. No. 1,031,113; July 2, 1912.)

MAGNETIC SEPARATOR. Frank C. Heinen, Chicago, Ill. (U. S. No. 1,026,673; May 21, 1912.)

ORE-FEEDER. Walter E. Wahlin, Garfield, Utah. (U. S. No. 1,032, 256; July 9, 1912.)

ORE SEPARATOR. Frank C. O'Brien, Denver, Colo., and Frederick C. O'Brien, Prescott, Ariz. (U. S. No. 1,031,285; July 2, 1912.)

PULP SCREEN. Edward J. Pope, Holyoke, Mass., and John W. Mullen, St. Joseph, Mich. (U. S. No. 1,032,701; July 16, 1912.)

SCREENING—Improvements Relating to Processes and Apparatus for Screening Ore and the Like. G. H. Stanley, Johannesburg, S. A. (Brit. No. 22,683 of 1911.)

STORAGE—Storage of Coal, Ores, Etc. William F. Hunt, New Brighton, N. Y., assignor to C. W. Hunt Co., West New Brighton, N. Y. (U. S. No. 1,026,444; May 14, 1912.)

METALLURGY—GENERAL

CASTING—Process for Casting Molten Metals under Pressure. Franz de Buigne, Magdeburg, Germany. (U. S. No. 1,026,733; May 21, 1912.)

CASTING APPARATUS. John Wilson Brown, Jr., Philadelphia, Penn., assignor to Enterprise Manufacturing Co., of Pennsylvania, Philadelphia, Penn. (U. S. No. 1,027,316; May 21, 1912.)

CONVERTER. Srol Boruchow Frumkin, Minsk Russia. (U. S. No. 1,025,260; May 7, 1912.)

CONVERTER for the Separation of the Fixed and Volatile Metals in Complex Ores. Marcel Collin, Paris, France. (U. S. No. 1,033,062; July 16, 1912.)

CONVEYING APPARATUS. Arthur S. Dwight, New York, N. Y., assignor to Dwight & Lloyd Metallurgical Co. (U. S. No. 1,027,111; May 21, 1912.)

CRUCIBLE COVER. Thomas McGrath, Springfield, Mass. (U. S. No. 1,029,815; June 18, 1912.)

DISCHARGING APPARATUS—Improvements in Apparatus for Discharging Metallurgical Furnaces. E. Gottlieb, Frankfort, Germany. (Brit. No. 883 of 1912.)

ELECTRIC FURNACE for Smelting and Reduction of Ore. Hans Bie Lorentzen, Notodden, Norway. (U. S. No. 1,030,904; July 2, 1912.)

ELECTRIC FURNACES — Improvements in Electric Furnaces. H. Plauson, W. Zsvetaeff, G. Tistchenko, St. Petersburg, Russia. (Brit. No. 10,858 of 1911.)

ELECTRIC FURNACES—Improvements in or Relating to Electric Furnaces. M. Ruthenburg, London, Eng. (Brit. No. 28,126 of 1910.)

EXTRACTION—Processes and Apparatus for Extracting Metals from their Ores. H. S. Mackay, Riverside, Cal. (Brit. No. 13,499 of 1911.)

FUME—Collection of Fume, Flue-Dust, and other Matter Suspended in Gas. Richard Francis Pearce, Liverpool, England. (U. S. No. 1,028,487; June 4, 1912.)

FUME ARRESTER. Lorenzo D. Royce, Oakland, and Louis Wallerstein, San Francisco, Cal. (U. S. No. 1,031,089; July 2, 1912.)

GAS OR SMOKE WASHER. Oliver M. Foster, Elkhart, Ind., assignor, by mesne assignments, of one-fifth to S. K. Dickerson, one-fifth to D. R. MacBain, and one-fifth to DeWitt C. Moore, Cleveland, Ohio, and one-fifth to Charles E. Schaff, Chicago, Ill. (U. S. No. 1,026,666; May 21, 1912.)

ORE-SAMPLING DEVICE. Leslie M. Sheridan, Anaconda, Mont. (U. S. No. 1,031,385; July 2, 1912.)

POWDERED-FUEL-FEEDING APPARATUS. William R. Dunn, Easton, Penn. (U. S. No. 1,028,-997; June 11, 1912.)

REDUCTION OF REFRACTORY ORES in the Electric Furnace. Frank J. Tone, Niagara Falls, N. Y. (U. S. No. 1,028,151; June 4, 1912.)

REFINING—Process and Apparatus for Extracting and Refining Metals and Alloys. Albert E. Greene, Chicago, Ill. (U. S. No. 1,031,257; July 2, 1912.)

RESIDUES—Means for Handling Smelting-Furnace Residues. Emile Dor-Delattre, Liege, Belgium. (U. S. No. 1,031,918; July 9, 1912.)

RETORT FURNACES—Improvements in or Relating to Retort Furnaces and the Like. Stettiner Chamotte-Fabrik Actien-Gesellschaft vormals Didier, Stettin, Germany. (Brit. No. 1608 of 1912.)

ROASTING—A Process of Roasting Ore and Apparatus Therefor. R. Scherfenberg, Berlin, Germany (Brit. No. 25,443 of 1911.)

ROASTING—Helixoidal Combined Ore-Roasting Furnace and Cooling-Hearth. Ellsworth A. Clark and William H. Davis, Boulder, Colo. (U. S. No. 1,029,667; June 18, 1912.)

ROASTING—Improvements in or Relating to Mechanical Ore-Roasting and Like Furnaces. J. Harris, Sheffield, Eng. (Brit. No. 25,142 of 1911.)

ROASTING AND SINTERING—Apparatus for Roasting and Sintering Ores. Arthur S. Dwight, New York, N. Y., assignor, by direct and mesne assignments to Dwight & Lloyd Metallurgical Co., Jersey City, N. J. (U. S. No. 13,423, reissue; May 28, 1912.)

ROASTING AND SINTERING—Process of Roasting and Sintering Ores and Product Resulting Therefrom. Arthur S. Dwight, New York, N. Y., assignor, by direct and mesne assignments, to Dwight & Lloyd Metallurgical Co., Jersey City, N. J. (U. S. No. 1,3424, reissue; May 28, 1912.)

SMELTER. Allan R. Partridge, Denver, Colo., assignor to Partridge Smelting & Refining Co., Denver, Colo. (U. S. No. 1,025,922; May 7, 1912.)

SMELTER FUMES—Bag House. Albert J. Meier, Glendale, Mo. (U. S. No. 1,030,477; June 25, 1912.)

SMELTER FUMES—Condenser for Smelter-Furnace Fumes. Constantine E. M. Tambacopolo, New York, N. Y. (U. S. No. 1,023,600; Apr. 15, 1912.)

SMELTER FUMES—Purification of Gases. Willis R. Whitney, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,022,012; Apr. 2, 1912.)

SMELTER FURNACE. Watson Marshall Nesbit and Edward Pike, Eureka, Utah. (U. S. No. 1,027,882; May 28, 1912.)

WELDING or Cutting Apparatus. John Walter Whitford, Jersey City, N. J., assignor to Davis-Bournonville Acetylene Development Co., (U. S. No. 1,028,166; June 4, 1912.)

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

There is a vacancy in a junior position on the editorial staff of the JOURNAL. Experience in mining is an essential qualification.

Kirby Thomas, of New York, is in Ontario on professional business.

Charles Butters has been visiting the Nipissing high-grade plant at Cobalt, Ontario.

Edwin J. Collins, has returned to Duluth, Minn., from a two weeks examination trip in Wyoming.

R. S. Botsford has left London for the Ural Mountains. His address is Bogoslovsk, Government of Perm, Russia.

Richard B. Stanford is again at his office in New Orleans, after a stay of two months in Honduras, Central America.

G. L. Sheldon sails from Seattle, Wash., for Katalla, Alaska, July 27. He will return about the middle of September.

Dr. C. D. Walcott is conducting paleontological investigations in the Yellowhead pass, Rocky Mountains, B. C., for the Geological Survey of Canada.

G. C. Bateman has been appointed representative for the Canadian Mining & Exploration Co., with headquarters at the Dome mine, South Porcupine, Ontario.

B. F. Noehl, of the W.-O.-N. Engineering Co., Los Angeles, Calif., is in Arizona on professional business. He will return to Los Angeles early in August.

George Jacob Davis, for some time past at the University of Wisconsin, has been appointed dean of the College of Engineering at the University of Alabama.

Thomas H. Leggett, of Leggett & Hellmann, New York, has been appointed consulting engineer of the mining department of the American Smelting & Refining Company.

Ernest McCullough, of Chicago, has been engaged by the University of Kansas to lecture on mining methods at the summer school to be held in Weir City, Kan., commencing July 22, and continuing for six weeks.

George Irving Adams, until recently of the United States Geological Survey at Washington, sailed from San Francisco for China July 12 to take charge of the mining and geological departments of the Pei Yang University at Tientsin.

Prof. Ross C. Purdy, one of the foremost authorities on ceramics in America, has resigned as professor of ceramic engineering at Ohio State University, Columbus, Ohio, and has taken charge of the research laboratories of the Norton Co., Worcester, Mass. Professor Purdy was formerly president of the American Ceramic Society.

James M. Swank, vice-president and general manager of the American Iron & Steel Association, on his eightieth birthday, July 12, received a large number of letters and telegrams of congratulation. These came from many men prominent in the iron and steel industry, from men in government service and from foreign engineers and statisticians. Herr Schoedter, general manager of the Verein Deutscher Eisen-Huttenleute, wrote: "In unison with the whole American iron industry, we take this opportunity to thankfully acknowledge the unparalleled service that you have rendered, not for the United States only, but also for the iron industry of the whole world, through your exemplary labors in the collection of statistics of iron production. Your name will be linked for all time with this unparalleled collection of statistics."

OBITUARY

C. V. Stewart died at Kansas City, Mo., July 12. He had been for a number of years engaged with the Daly interests of New York, and had done much work at Silver City, and in the Burro Mountains in New Mexico.

F. O. Pellham died at Callabacillos, Chihuahua, Mexico, June 3, after a long illness. He was for a number of years in Colorado, but went to Mexico 15 years ago, and since then had been in charge of mills at Lluvia de Oro, Topia and Callabacillos. He had a high reputation as a mining man and was much liked and respected both by Mexicans and Americans.

Thomas W. Phillips died at New Castle, Penn., July 21, aged 77 years. He was born in Beaver County, Penn., and had lived at New Castle for many years. He engaged in the oil business at an early date and was a large operator, being president of the T. W. Phillips Oil & Gas Co., which controls over 500 wells. He served several terms in Congress and in 1898 was a member of the Industrial Commission.

M. E. McCarthy, superintendent of the Live Oak mine of the Inspiration Consolidated Co., died very suddenly of heart disease on July 16, as he was coming from the mine to Globe, Arizona, in his automobile. Mr. McCarthy was manager of the Hovland & Smith properties for the last six years and developed the Live Oak from a prospect to a proven mine. He was one of the best known and best liked mine managers of the district.

George W. Botsford died at Houghton, Mich., July 17, aged 65 years. He was born in Michigan, and settled in the copper country 40 years ago. He was for a number of years connected with the Franklin and other mines as manager of the commercial department. He married in 1875 Miss Elizabeth McKernan of L'Anse, daughter of the late John Q. McKernan.

John H. Bartow, 66 years old, president of the Lake Erie Ore Co., and a director in several iron and steamship companies, died early last week at his residence in Cleveland. Mr. Bartow went to Cleveland 35 years ago from Buffalo, and started as a vessel broker. Later he became interested in several ore mines and steamship companies. He was a director in the Carter Steamship Co., Cleveland Steamship Co., Salem Iron Co., Salem, Ohio; Erie Steamship Co., Valley Steamship Co., and the Valley Transit Co., in addition to being president of the Lake Erie Ore Co. At one time, he was vice-president of the MacDonald Ore Co., the Young Exploration Co. and the Groveland Mining Co., three Michigan concerns.

Capt. William A. Nevills died, at San Francisco, on July 10. He was born in England and was about 82 years old. He was taken to Canada when a child by his parents and when a young man served in the British army both in Canada and in England. He went to California about 25 years ago and became a prominent factor in the early development of deep quartz mines on the Mother Lode. He was the owner of the Moore mine and the Mammoth mine, in Amador County, and later acquired the Rawhide and the App and Heslep mines, in Tuolumne County. The Rawhide, the Moore and the Mammoth had not been in operation for some years, but the App was closed down only within the past month. Litigation has disturbed the operation, and the failure to sell the App recently was partially the cause of closing it down. This mine and other properties of Captain Nevills were advertised to be sold under a trust deed on July 16, at Fresno. Captain Nevills's mother, now 105 years old, survives him.

Societies and Technical Schools

Northern California & Southern Oregon Mining Congress—A meeting of this body was held at Yreka, Calif., on July 19 and 20. Special invitations were sent to mining men in Shasta, Trinity and Del Norte counties.

California State Miners' Association—This society will issue a call for a convention of mining men, to be held in San Francisco, for the purpose of preparing for the participation of the Western states in the mining exhibits to be made at the Panama-Pacific exposition, in 1915. At a meeting of the association, July 15, at San Francisco, W. C. Ralston, E. B. Braden and Charles G. Yale were appointed a committee to communicate with the governors of the several mining states, asking them to send representatives to San Francisco for a conference on the subject and to devise a plan for an exhibit of minerals, metals and methods of mining.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

July 18—The California Supreme Court has handed down a decision in the injunction proceedings against the Selby Smelting & Lead Co., affirming the lower court. The question of whether the farm crops of Solano County have been damaged by the fumes from the Selby plant has not yet been tried in the lower court. To facilitate the trial the board of supervisors of Solano County has appointed T. T. C. Gregory as an expert to assist the district attorney in securing evidence as to the effect of the fumes. These injunction suits originated in 1906. Since their origin there have been many improvements and changes in the operation of the smeltery, and appliances and devices installed to prevent the escape of damaging fumes. Expert chemists have shown there is no damage being done. The hay crop, which is the chief crop in the vicinity, orchards, flowers and other vegetation are healthy and show no damage from fumes. There is no complaint from the farmers in Contra Costa County, whose farms are within closer range of the smeltery, and not separated by a body of water. These facts will doubtless be brought out in the trial of the injunction suits, which will probably settle the matter.

The Anderson & Bella Vista R.R., in Shasta County, has been purchased by the California, Shasta & Eastern Ry. Co., and will be extended from Bella Vista to the Afterthought mines at Ingot. It is the purpose also to extend the road beyond the mines and into the timber sections of Montgomery Creek, where there are large tracts of timber held by the Walker interests, the Terry Lumber Co., the Benton Lumber Co. and other lumber interests. It is understood that the Southern Pacific R.R. contemplates the construction of a road either down South Cow Creek or down Deer Creek. These two railroads will open up a vast territory of timber and give better transportation facilities to the mining districts of the northeastern part of the state. The initial work preparatory to the construction of the line from Bella Vista to Ingot is in progress, and work is in progress at the Afterthought mines. As the company now has large bodies of ore developed and blocked out it is the present policy to devote energy and capital chiefly to the extension of the railroad to the mines and to install a suitable reduction plant for the recovery of the zinc.

Denver

July 19—The Tomboy company, which owns the Argentine and Cincinnati mines in Savage Basin and which has more recently acquired the Montana in the Smuggler Basin above Telluride, crushed 8400 tons in June, worth $81,500, giving profits of $40,500. In the same period Stratton's Independence netted $14,500. With these two producers, and Camp Bird, Ltd., also owned in London, it would seem that Colorado as a field for mining, would offer attraction to foreign interests.

As a further indication of the immense business the railroads of the West expect to do this year, may be cited the fact that in addition to the large steel orders already given to the Minnequa plant at Pueblo, by four lines, the Denver & Rio Grande R.R. recently awarded contracts for 350 all-steel coal cars, 700 box cars, 100 stock cars and 50 cabooses, at a cost of $1,100,000. The coal cars will be all steel with drop doors so that the entire load of coal may be automatically dumped. Thirty freight locomotives have also been ordered from the American Locomotive Co., at Schenectady, New York, and the Baldwin works at Philadelphia. The Mikado type of locomotive, of which 14 have just been ordered, will be a part of the new equipment. These will be the first large engines of this type to be operated in this territory, and will develop about 20% more power than the largest freight engines now operated by the Rio Grande. Early delivery was made a part of the contract in order to meet the demand for fruit delivery on the western slope.

Butte

July 17—Since the phenomenal rise of the Butte & Superior from a copper prospect to one of the richest zinc mines in the country, a rush has been made to secure claims in the vicinity. Options have been taken on nearly all of the claims north of the Butte & Superior mine by various interests and it appears likely that in the future Butte will be exploited, to a considerable extent, for its zinc mines. A. B. Wolvin, president of the Butte & Superior, is a prominent figure in the new field, and in company with John M. Hayes, of Salt Lake City, a Guggenheim representative, he is said to have secured options to buy interests in four claims, the Lone Star, Wedge, Hidden Treasure and Sarah, adjoining the Butte-Milwaukee property on the east. Mr. Wolvin also has an 18 months' option on the Brundy claims, consisting of the Macarona, Montgomery, a one-half interest in the Altoona, and an interest in the Colleen, Bawn and Amazon lode claims, situated southeast of the Pittsmont property. Three important claims, the Third Sphinx, Michigander and Alma, lying between the Butte & Superior and North Butte Extension properties, have been bonded to E. B. Milburn, of Butte. The Butte & Superior company owns a controlling interest in the property of the Butte-Milwaukee and North Butte Extension companies. The former holdings have been prospected with good results. There is talk of the Butte & Bacorn mine resuming operations, as well as the Butte & London, Colusa-Leonard Extension, Bullwhacker and Amazon-Butte companies.

Dwight Chaffee, a well driller of Great Falls, recently struck a strong flow of gas while drilling a well on the farm of Henry Hurd, near Big Sandy, 45 miles northeast of Great Falls. The gas was encountered at 500 ft. and issued from the hole at an estimated pressure of 300 lb. The drill was in shale rock when the flow started and the gas is passing through 200 ft. of water. The find immediately caused a rush to the place and options are being taken on land in the vicinity.

Kingman, Ariz.

July 17—It is likely that Mohave County will soon receive greater recognition as a metal producer than heretofore, not only on account of constantly increasing production but also because of the better facilities for outsiders to inspect the mines and prospects. One familiar with the resources of the county finds it difficult, at times, to understand the reasons for its past slowness of development when compared with other districts less favored by natural conditions. The perseverance of a few men has made possible the present output of the Gold Road and Tom Reed mines and the records of these two, while giving a better understanding of conditions encountered in that particular vicinity, have added impetus to the development of numerous properties in the county.

There is an agitation for better roads, as a result of which the supervisors have lately spent some time in the preliminary survey of a road across the county which is expected to become a part of the Na-

tional Automobile Highway. This road has been mapped out from the Colorado River on the western side of the county, passing through Oatman, where the Tom Reed mine is situated, Gold Road, Kingman and thence following closely the line of the Santa Fé R.R. to the county's eastern boundary. It is understood that E. F. Thompson has interviewed Washington authorities in regard to diverting a portion of the surplus funds of the Indian School at Truxton, to building a branch road into Diamond Cañon on the Colorado River and that there is a reasonable assurance of its being carried out. Work has been commenced on the road between Kingman and Gold Road in Kingman Cañon, this being the most important road in the county, as all supplies for the Gold Road, Tom Reed and other mines are received at Kingman and thence freighted to their destination.

The taxation of the mines is a pertinent subject of discussion at present, due to the recent visit of the State Board of Tax Commissioners, that met with the county board of equalization last week. Several prominent mining men of the county appeared before the board to furnish data. According to a recent ruling of the state board, all producing mines must be listed according to their gross production and the assessment levied on that basis. While this method will undoubtedly give more easily ascertainable data from which to calculate the assessable value, it will also levy an apparently disproportionate burden of taxation upon properties where unfavorable conditions increase the cost of production.

Negaunee, Mich.

July 20—Over 7,500,000 tons of iron ore were shipped in June from the upper lake ports. This compares favorably with the record year of 1910 when 7,316,592 tons were shipped during the same month. The above production for June, this year, was sent out from six ports, Superior leading with 2,348,606 tons; Duluth, 1,551,214; Two Harbors, 1,445,669; Marquette, 561,976 tons. Escanaba and Ashland each shipped about 100,000 tons. The heavy shipments from Superior were caused by the contracts which the Great Northern Ry. has with the Steel Corporation in connection with the Hill ore lands. A few years ago Duluth shipped nearly twice as much ore as Superior but the conditions are now reversed.

Governor Osborn has ordered a rehearing of the iron-mine taxation cases which were acted upon in Houghton a few weeks ago. At that meeting of the State Tax Commission, at which Prof. C. K. Leith, iron-ore expert, was present, the valuations of several mines on the Gogebic and Menominee Ranges were lowered, owing to the evidence presented by the mining companies. Oglebay, Norton & Co., Corrigan, McKinney & Co., and Pickands, Mather & Co. were the beneficiaries by the reductions, and it is claimed by individual taxpayers that no notice of the meeting had been given them so that but one side of the cases, that of the mining companies, was presented.

Toronto

July 20—The attention of the officials of the Ontario Bureau of Mines is being directed to the large increase in the number of fatal mining accidents due to the increased employment of electricity as a motive power in mining. While accidents from other causes show a marked decrease, owing to the stricter enforcement of the regulations, fatalities caused by electricity are of more frequent occurrence. Owing to the exhaustion of the supply of wood for fuel in the mining regions and the expense of bringing in coal, there has lately been a remarkable development in the use of electric power. This new factor has considerably cheapened the cost of production. The cost of horsepower has been reduced from between $150 and $175 per hp. per year, to about $50 by the introduction of electricity, which has enabled the mining of ore that would have been found unprofitable with the use of steam power. Its introduction on a general scale brings with it a new peril to the safety of the workers, particularly at the outset, when a large proportion of the men are inexperienced in its use.

Sudbury, Ont.

July 20—Some recent discoveries of nickel ore on the western end of the nickel formation, made by Foster Shields and associates, are considered of importance and of interest as indicating the possibilities of the district, notwithstanding the prospecting which has been going on for several years. These discoveries are apparently on an "off-set" but in a general way are in the determined formation and have been heretofore overlooked because of the drift-covered character of the country. Other new discoveries have been made in Trill Township, south of the Shields locations. Last lear some new deposits were opened in Falconbridge Township on the southeastern corner of the nickel-bearing formation and drilling has developed commercial orebodies there. Probably not one-third of the known nickel-bearing formation in this district has been explored beyond a depth of 10 feet.

New nickel districts are announced from time to time but so far none have proven of commercial grade. A few years ago some rich phyrrotite from the Alexo mine, near Porcupine, attracted attention but explorations did not disclose sizeable deposits. This ore occurred with serpentine and the possibility of important deposits being found in the large serpentine areas of eastern Ontario and in Quebec, has been suggested. Last winter some phyrrotite from Burwash Lake, north of Sudbury, was investigated but the ore did not run high enough to be of present interest. Another large phyrrotite body west of Kenora, in western Ontario, has been investigated by Boston interests but this is reported to be below commercial grade. More recently a new nickel-bearing formation near Sault Ste. Marie is being investigated. The ore is reported to run more than 2½% nickel. The formation is similar to that at Sudbury. It is an interesting fact that all of the phyrrotite deposits of Ontario carry some nickel, often as much as 1% but so far it is only in the Sudbury district that commercial bodies of ore have been found, that is 3%, or better.

Cobalt

July 19—Prospectors are returning to Cobalt and other points in Northern Ontario from Lake Kienawisik and the Bell River district, to which there was a rush this spring. Little staking was done because of the generally unpromising character of the field. It is claimed by them that the geological maps published, regarding the Bell River district, are misleading, large areas marked as green schist being covered with drift, with only occasional outcroppings of rock. There appear to be better indications at Lake Kienawisik, but most of the locations there were made in the winter. Many prospectors are reported to have gone north by water routes to James Bay, on their way to Ungava.

Porcupine

July 18—The mine managers of the Pearl Lake section have agreed to conform to a common wage scale. This scale is approximately the same as is paid by the Dome and Hollinger mines. It is probable that this agreement will lead to the formation of a mine-managers association, along the same lines as the Cobalt organization. This will greatly strengthen the hands of the mine operators and will permit of concerted action in any matters which come up for their consideration.

The Miller-Middleton and Dixon mines are being developed by the Timmins-McMartin Syndicate and are opening extensive orebodies. The shafts are being sunk to conform to the levels on the Hollinger, so that the three properties can be worked from one main shaft should an amalgamation be decided upon. It is probable that a small mill will be erected at the No. 9 shaft of the Dixon.

The Mining News

The Current History of Mining

Alaska

Great Northern—This company, operating on Copper Mountain, has 35 men blocking out ore. There is some talk of erecting a 500-ton leaching plant to treat the product, of which there seems to be a quantity. The vein is 120 ft. wide, consisting of sulphides running about 4% copper. Electric drills are used, with a gasoline power plant. The extension of the Copper River R.R. up the Knokulana River will stimulate mining operations in that district. The Great Northern company is controlled by James Phillips, Jr., of the Nevada Consolidated, and E. F. Gray is manager. This company also has large interests on Iron Mountain, where 10 men are doing development, and also on the Kotsina River, where a similar force is working. The company is reported to have spent $1,500,000 in opening these properties and a large tonnage is in sight.

Regal Mines Co.—This company, which is a subsidiary of the Great Northern, is operating a property near Kennicott, with 15 men. A shaft is down 115 ft. on a contact between limestone and greenstone and sinking is progressing about 5 ft. per day. The ore is copper glance and rich enough to ship.

Arizona

Cochise County

Arizona United—The company has recently found a body of 6% copper-sulphide ore on the seventh level of the Republic mine. The ore has been penetrated for 150 ft. Work has been resumed upon the Mammoth mine and good ore is being taken out from the second and third levels. Regular shipments will be made to the El Paso smeltery. The first three cars are said to have run over 6% copper.

Gila County

The working time of churn-drillers and their helpers at the mines of the Miami district has been reduced from 12 to 8 hr. per day. Drillers will receive $5 and helpers $4 per day. The new scale went into effect July 15.

Miami—The production for June was 2,683,310 lb. During the month 4964 ft. of development work were done. The development of the Captain orebody, a tongue from the main orebody, will begin soon. Equipment will be erected at the Captain shaft, which will be connected with the main shaft by a drift from the main orebody on the 420-ft. level. It is estimated that the Captain orebody contains about 3,000,000 tons of ore. A second churn-drill will be put to work on the northeastern part of the property where there is another large body of ore, assaying from 1% to 1¼% copper. Exploration of the ground below the 570-ft. level continues.

South Live Oak—Churn-drill hole No. 2 is over 400 ft. deep in granite.

Superior & Boston—The company has begun to ship ore from the Limestone vein and shipments from the Great Eastern vein continue.

Copper Reef—It is reported that the drift on the California vein has passed through the fault recently encountered and entered vein matter carrying copper, gold and silver.

Iron Cap—F. A. Woodward, general manager, has received instructions to begin the operation of the mine on the plans that he outlined in a recent report. The hoisting and compressing machinery at the Williams shaft is being overhauled and active development work will be started soon. The Williams shaft is 800 ft. deep. It is proposed to drift westerly on the vein. The property lies between the Copper Hill and Eureka shafts of the Arizona Commercial.

McMorris—At this mine in Richmond Basin, eight miles northeast of Globe, the 800-ft., 2-compartment shaft has been retimbered to the 200-ft. level and the exploration of that level will soon be started. The mine is being operated by the White Metal Development Co., and George Wilson is superintendent.

Graham County

Arizona Copper Co.—The results of operations for the six months ended Mar. 31, show total profits of £176,447. Total dividends amounted to £12,266, leaving £164,181. It has been decided to pay an interim dividend of £94,994, leaving £69,187 to be carried forward.

Mohave County

Williams—This tungsten mine, owned by E. Williams, is situated in the Aquarius Mountains, about 60 miles southeast of Kingman. A bond and lease has been given to men represented by Seeley W. Mudd, for whom Mr. Williams has recently done some development work. Tungsten ore was recovered during the course of the work.

Reco—E. S. Osborne has taken a short option on this property with the intention of interesting Los Angeles men in its development. Samples recently exhibited showed free gold. The mine is in the Wallapai district, in C. O. D. cañon, near the old C. O. D. mine.

Frisco—Manager E. H. Barton brought a $7000 bar of bullion in from the mine last week, the result of two weeks operation of the mill.

Mineral Park—H. E. Bierce, of Denver, has bonded this copper mine belonging to Thomas McNeely. A crosscut is being driven to explore several veins.

Mitchell—A crosscut is being driven at the 400-ft. level to cut the orebody. At all points where the vein has been cut so far, good orebodies have been found.

Tom Reed—Last week a $79,000 bar of bullion was brought in from the mine, the result of the monthly cleanup.

Gold Road—Recently a $20,000 bar of bullion was sent into Kingman from the mine. This was from a week's operation of the plant. It is understood that additions and improvements to the milling equipment will be made within the next six months, which will practically double the production.

Mocking Bird—This mine is being operated by W. H. Hall. Considerable work has been done lately and the ore now in sight is estimated at about $80,000, its value being from $15 to $80 per ton.

Pinal County

Lake Superior & Arizona Mining & Smelting Co.—The company has given an option on its property to the American Smelting & Refining Co. The property consists of 17 claims adjoining the Magma Copper Co., at Superior, 30 miles west of Globe. The A. S. & R. Co. is given until Oct. 20, 1912, to unwater and examine the mine, after which, should it so elect, it is given two years in which to develop the mine, and make the payments. The purchasing company has the choice of making total payments of $400,000 cash and two-fifths of the authorized capital stock of the company which it shall organize to operate the mine, or, under an alternate plan, of $800,000 cash if it elects to purchase the property at the end of one year or $1,000,000 cash at the end of two years. F. W. Hoar, of Globe, represents the L. S. & A. Co. and J. Kruttschnitt, Jr., representing the A. S.

& R. Co. has gone to Superior to make preparations for unwatering the mine. The mine is opened by an inclined shaft 1300 ft. deep and about four miles of drifts. Some oxidized ore is exposed, averaging about 4% copper, and $50,000 worth of higher-grade ore was shipped from one stope, but it is upon the possibility of opening up sulphide ores at depth that the future of the mine depends. Sulphides were beginning to appear at the bottom of the shaft when the mine was closed down.

California

Amador County

Argonaut—John Libby, a shift boss, and James Nancarrow, foreman, were badly injured at the head of a raise in a stope in this mine, at the 3400-ft. level. A wedge of ore, weighing about 100 tons, dropped suddenly, the fall compressing the air and causing a rush down the raise. Libby was knocked 50 ft., landing on a pile of ore. Nancarrow was thrown across the rails of the car track.

Zeila—A winze is being sunk below the 1500-ft. level, to explore the lower ground. The mill will be run on ores from the upper levels.

South Jackson—The 100-ft. shaft will be deepened to 500 ft. before prospecting the vein. The shaft is a 3-compartment vertical one. The mine is equipped with modern machinery. The shots are fired by electricity. No shots are fired underground, nor while the men are underground. About $14,000 has been expended for construction and equipment since Apr. 1, by the present owner, the South Jackson Mining Company.

Butte County

New dredging ground is reported to have been discovered east of the town of Honcut. The ground is being prospected.

Robinson—Sixteen men are employed at this mine, in Granite basin, at sinking and other exploration work. Prospecting is in progress on neighboring claims.

Calaveras County

Tanner—Good ore is being disclosed in the shaft and sinking is in progress. The tunnel is also being advanced with two shifts.

Penn—The mine force has been increased by 25 men. It is expected that the blast furnace will be placed in commission again soon.

Ford—A strike of high-grade ore is reported at this mine, at San Andreas, at a depth of 40 ft. Whether it is a pocket or a continuous vein will be determined by further exploration. The formation is similar to that in the Gwinn mine.

Inyo County

Christmas Gift—The second car of ore taken from this mine, in the Darwin district, by the present owners, was shipped about the first of July. This mine was located on Dec. 25, 1874. William Skinner and brother leased the property last December and disclosed the vein within 6 ft. of their initial work.

Custer—Seventy feet of new work have been done recently. A drift has been driven under the old workings, and favorable results attained in the uncovering of vein matter. John Thorndike, of Darwin, is the leaser.

Lucky Jim—This mine, in the Darwin district, is now down 900 ft., and other mines in the district will be sunk deeper, as this one has made a good showing. The vein matter between walls in the stopes is 50 ft. wide.

San Bernardino County

The Needles district has been attracting attention recently. R. E. Zuber and James Carter, of the Gold Roads region, went to Los Angeles recently to secure a cyanide plant for handling the tailings of several of the mines. The Gold Chief mine, near Barnwell, is reported to be in good condition and development work is steadily progressing. The Lead Mountain Mining Co., owning properties south of Bagdad, has installed a motor-truck service between Bagdad and the mines. A concentrating plant is being installed for the handling of tailings which were left by former operators.

Four-Ace Mining Co.—This company has secured a lease on the Santa Ana mine and recently disclosed high-grade ore. A small shipment was sent to the Red Dog mill.

Modoc County

Hess—A gold brick, weighing 8 lb., was shipped about July 15. The mill is working on ore from an 8-ft. vein, containing some medium-grade ore. James Harvey is the leaser.

Gold Shore—Development and prospecting have indicated that this claim is on the mineralized zone embracing the Sunshine and the Yellow Jacket mines, which are the best developed properties in the Highgrade district.

Sunshine—A car of ore has been shipped from the Schauers & Laughlin lease to Selby. The company has canceled the lease and will work the mine on its own account.

Buttes—Good ore is reported to have been disclosed in the Merrifield Smith lease on this mine, at Windy Hollow. The installation of a stamp mill is contemplated.

Nevada County

Excelsior—The shaft has been unwatered. The directors of the owning company are expected from Colorado Springs, Colo., to make an examination.

Campion—Work will be resumed on this group, in the Meadow Lake district. Z. Campion, of San Francisco, is owner.

Buckeye—Work has been resumed at this mine, in Willow Valley. A 25-ft. shaft has been sunk to tap the extension of the old Harmony channel. The Cold Spring Mining Co. is the owner. W. G. Motley, an Eastern man, is president.

Oustomah—A purchase bond has been taken for a term of three years by E. C. Klinker, of Reno, Nev. The Eddy holdings below the 200-ft. level embrace about 500 acres of unexplored ground.

Placer County

Pacific Portland Cement Co.—This company has purchased the railroad constructed from Auburn to the quarries, and which crosses the middle fork of American River over a concrete bridge, completed this year. It is reported that the cement company has also purchased the quarries and will develop the limestone deposits.

Great Western—Extensive development work is planned in the opening of properties near Westville, on the Forest Hill divide. Walker & Lass, of Auburn, are directing the work.

Colorado

Boulder County

Colorado Chemical & Metals Co.—The Bailey mill, at Eldora, operated by this company, has temporarily suspended work while a roaster is added to the equipment. B. W. Johnson is manager.

Carmine Tungsten Co.—The company has received its electrical equipment, which is being installed rapidly. A. N. Zwetow and M. J. Mayer are the managers.

Burlington-Boulder Mining Co.—This company, operating the Burlington group of claims on Left Hand Creek, near Glendale, is driving a new crosscut to develop the vein at a greater depth. J. G. Boundy is manager.

Primos Mining & Milling Co.—The company shipped two cars of tungsten concentrates recently from the Lakewood mill. C. F. Lake is manager. A 6-ton auto truck is used to transport ore from the mines to the mill, at Newmire.

Clear Creek County

Phoenix—This mine will soon be unwatered through a diamond-drill hole connecting with the 14th level of the Phœnix mine. The hole will be 1½ in. in diameter, 350 ft. long and will have an upward inclination of 70°. The water will be tapped at a depth of 600 ft. The volume of water to be drained through the hole is estimated at 18,000,000 gal.

After the mine is unwatered the property will be operated through the Newhouse tunnel. A Bullock & Sullivan diamond drill will be used. The contract for the drilling has been let to Messrs. Shank & Ahearn, of Denver. Walter A. Funk is the engineer directing the work. R. H. Sayre is manager of the Phœnix-Ophir Mining Company.

Big Five—The 4-ton, storage-battery motor hauls a train of 40 cars, or about 130 tons, from the breast of the tunnel to the custom mill at Idaho Springs.

Newhouse—Work has commenced on the sampling works and mill. Twenty men are employed on the excavations for the foundations and contracts have been let for some of the machinery. The sampling works will have a capacity of 350 tons and the first unit of the mill a capacity of 100 tons. It is estimated that a recovery of 85 to 95% will be made. The situation of the mill at the portal of the tunnel will result in an important saving of freight and haulage charges on all ore mined by interests operating through the tunnel.

LAKE COUNTY—LEADVILLE

Many electric hoists are being installed in the district, a new gallows frame is being placed over No. 3 shaft of the Colonel Sellers, another has been ordered by Hawkins & Co. for the La Plata shaft and a 37-hp. hoist is to be installed at the Tip Top shaft on Fryer Hill. Another is to be put on the Old Elk shaft by the lessees of the Hibschle.

Mount Champion Co.—This company, whose mine is at 12,000 ft. elevation in Lackawanna Gulch, is employing 50 men in development work by tunnels and raises, and in completing the mill and aërial tramway.

Miller Mining & Tunnel Co.—This company's properties are situated above Twin Lakes and Everetts and 35 men are employed. The orebodies are in fissure veins in the granite and about 1000 tons per month of smelting and milling ores are being produced, the grade ranging from $5 to $65 in gold, and 5 to 25 oz. silver per ton. The surface plant consists of five boilers, 60 to 250 hp., 12x12-in. steam hoist, 125-hp. turbine wheel, five drill compressors, a 5-hp. motor, amalgamating and concentrating mill and a 3400-ft. aërial tram; the head office is at Twin Lakes.

SAN MIGUEL COUNTY

Butterfly-Terrible—This mine, which is being operated by D. J. Sayer as manager and lessee, is again in full operation, after a shutdown of 2½ months, caused by landslides taking out the power flume.

Suffolk—This mine, now owned by the Ophir Mines Mining & Milling Co., is installing a cyanide plant under the direction of George Pickett. It is anticipated that with the additional equipment there will be a good saving made in the milling. This addition to the mill will probably be finished within two months.

Crown Point—E. E. Bassett has returned to Ophir; he has taken a lease on this property and has begun active operations.

TELLER COUNTY—CRIPPLE CREEK

Doctor-Jack Pot—The lessees are doing well and one of the best strikes in the district for some time has been made by Jerome Beard, in a drift from the bottom of the Davenport shaft. The first car of 32 tons shipped out returned $48 per ton. The shoot has been opened for 30 ft. in length and is 18 in. wide. Wilson Bros., lessees, are shipping three cars per week that will average about 1 oz. gold per ton, and Bailey & Gates took a car from the Lucky Corner which ran $44 per ton, while Carl Evans has sent out a car estimated at about 2 oz. per ton.

El Paso Consolidated—With a view to building a mill for the treatment of the product of the El Paso mine on Beacon Hill, the character of the ores and the average grade through the mine are being ascertained by extensive sampling under the general direction of T. R. Countryman, engineer for the deep drainage tunnel, who has three parties of samplers going through the mine. This work has been going on for three weeks and will take a month more for completion.

Idaho

BLAINE COUNTY

Greyhound—Operations have been suspended pending litigation and because of dissensions among stockholders.

Elkhorn—Gold ore has recently been developed in these properties in Parker Gulch, near Ketchum. One car was recently shipped and two more will soon be forwarded to the General Engineering Works, Salt Lake City, for testing purposes, preliminary to the designing and installation of a mill. The property is controlled by New York men.

Illinois

Reports state that a combination of coal-mining interests is about to be effected in the central part of the state. The plans include a merger of coal companies in central Illinois, erection of a large power plant at Kincaid, from which current will be taken to operate the Commonwealth Electric properties, including those in Chicago. Francis S. Peabody, of Chicago, is said to be largely interested. A merger of many large power plants in that part of the state is said to be under consideration.

Michigan

COPPER

Osceola Consolidated—At No. 4 shaft of the North Kearsarge branch, water broke through at the eighth level on July 19, causing a suspension of operations for about one-half day. The water came through a cavein from surface, but clogged itself within a few hours. It is now being held and a concrete dam is being built. When the water broke through it was deemed advisable to take all the men to surface, but all the shafts with the exception of No. 4 have resumed operation.

Calumet & Hecla—No. 21 shaft, the only one that this company is operating on the Kearsarge lode, is down to the 20th level and is opening excellent ground in the lower drifts, particularly at the 16th and 17th levels south and the 18th level north at points considerably distant from the shaft.

Indiana—The shaft is sinking below 950 ft., and should reach the felsite formation within the next 50 feet.

Houghton—The company has added additional drills and has replaced the temporary bucket with a skip of much larger capacity, so that development can be carried on more advantageously. Openings on the main lode are encouraging and further opening of the West lode will be watched with interest.

Isle Royale—The new hoisting equipment at No. 5 shaft has gone into commission. This equipment was bought from the Tamarack company, and is of ample capacity to meet the future needs of this shaft. Rock shipments from this shaft will gradually be increased. The shaft is now sending about 200 tons per day to the mill. Underground conditions at this point are satisfactory. The shaft is sinking below the ninth level.

Superior—Sinking is to be resumed at No. 2 shaft, below the 13th level. The shaft will be sunk considerably deeper and a search made for the West vein.

Tamarack—A tube mill has been installed at the mill and an extended test will be made on the regrinding of the tailings.

IRON

American—Machinery for the concentrator being erected by the Denver Engineering Works Co., has been received.

Imperial—The stockpile at this Cleveland-Cliffs mine, at Michigamme, is being rapidly cleaned up. A new crusher will be erected soon and the shaft widened to permit balanced hoisting.

Mitchell—Two diamond drills are in operation at this Jones & Laughlin mine. Thirty-five men are employed and some ore is being produced for shipment. The mine has been operated and explored in a

small way for several years. Two diamond drills are also being operated near Iron Mountain Lake, south of Ishpeming.

Nevada Land Co.—This company, in which the E. J. Longyear Co. is interested, recently opened an orebody, with diamond drills, in Sections 13 and 14, T.42N.-R. 33 W., east of Buck Lake and near the old Mastodon mine. The property is said to be for sale.

Caspian—The steam shovel, formerly at this mine, at Iron River, has been moved to the Vivian mine, at Quinnesec, also controlled by Pickands, Mather & Co. The foundation for a new office has been laid at the Caspian. This company, like the Cleveland-Cliffs, is offering inducements to its house-dwellers to maintain well-kept gardens and lawns.

Minnesota

The fee-owners of the Norman mine, on the Mesabi Range, are reported to have filed suit against the Oliver Iron Mining Co. for $1,012,250, claiming that careless mining methods have ruined the property and have caused large loss of life in the past. Notice of the cancellation of the lease has already been given.

Montana

Butte District

Anaconda—The Tramway mine, which has been closed down for the last two months, has begun operations again with about 500 men. The mine was closed to permit changing the hoisting engine from steam to compressed air, which necessitated enlarging the cylinders to over twice their former size, as well as realigning the engine. Both the main and auxiliary hoist have been remodeled to use air. The mines now being operated under the air system, in the order of installation, are: Mountain View, High Ore, Diamond, West Grayrock, Leonard and Tramway. The Pennsylvania will be the next and work will start there soon.

Pilot-Butte—A new hoist has been ordered and it is expected to arrive in about a week. The shaft has nearly reached the 1300-ft. point, where a station will be cut; sinking will then be continued to the 1800-ft. level before further development work is done. It seems probable that good copper ore will be opened at depth, as on the 1500-ft. level of the Elm Orlu mine, adjoining, a vein has been developed to within 30 ft. of the Pilot end line, the ore averaging 4% copper. This vein contained principally zinc ore on the levels above, and in this respect it is similar to the Badger State mine, of the Anaconda company. T. G. Murray, of St. Paul, a director and one of the principal stockholders, is in Butte at present to inspect the mine.

Deer Lodge County

Hidden Lake—Extensive development work with good results is being done on the Cecelia May No. 1 claim. Ore assaying $12 per ton was found within a few feet of the outcrop of the vein, and as the work extends downward the grade is found to increase. The latest report is that the inclined shaft, being sunk on the vein, is in ore averaging $16 per ton, principally in gold.

Nevada

Comstock Lode

Ophir—Work has been started on the new cyanide plant, and the machinery will be housed under a corrugated-iron building, 106x117 ft. The equipment will consist of a tube mill, a Dorr thickener, three Trent agitators, large storage tank, and Butters filters. The capacity will be 100 tons per day, and the plant will be driven by electric motors, aggregating 100 hp. The company has impounded 21,000 tons of tailings, valued at $126,000, and taking out the cost of the erection of the plant, $36,000, will leave a substantial margin of profit. The plant will also be connected directly with the Kinkead mill, and tailings hereafter will be sluiced directly to the cyanide works, forming a continuous process. The new works are being constructed under the direction of Walter Techow, mining engineer.

C. & C.—Connections have been made with the new high-tension cable from the substation of the Truckee River General Electric Co. This line in the future will carry the entire pump load of the north-end mines. The substation is to be connected with the new 60,000-volt line of the power company, extending to the new smeltery, at Thompson, in Lyon County, and will give to the Comstock district, continuous and uninterrupted service. There is now passing through the substation approximately 3500 hp., used for the pumps and mining operations.

Eureka County

The Eureka-Nevada Ry., formerly the Eureka & Palisade Ry., has recently purchased two new locomotives. These are now in commission and are hauling ore from this district and adjacent territory to Palisade. There are now 800 tons of sacked ore on cars in Eureka, awaiting shipment.

Credo-Eureka Mines Co.—This company has temporarily suspended operations and is preparing to remodel and enlarge its hoisting facilities.

Nevada Central Copper Co.—Two cars of high-grade ore were recently shipped to Salt Lake City. Extensive development is planned.

Windfall—The alterations and improvements being made in the mill are well under way and a new compressor has been installed. With resumption of operations it is expected that costs will be reduced materially and production increased.

Humboldt County

A cloudburst on July 18, is reported to have damaged badly the camp of Seven Troughs and to have destroyed the nearby town of Mazuma. Reports state that the loss of life was 13, the known dead being: John Trenchard, merchant, formerly of Victor, Colo., and his wife; Mrs. McLean, Mrs. Reese, Mike Qualen, miner; a son of Superintendent Gillespie, and four boys of the Keogh family, all of Mazuma. The wall of water swept down the cañon, carrying buildings before it and overturning the Mazuma Hotel. No loss of life is reported at Seven Troughs.

National—The suit with the Charleston Hill company, in progress at Carson City before Circuit Judge Farrington, is being bitterly fought. Some of the men representing the National are: H. V. Winchell, N. H. Winchell, H. L. Hollis and W. H. Wiley. The Charleston Hill company is retaining Albert Burch and A. C. Lawson.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended July 11, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,100	93,019
Tonopah Belmont	2,500	57,076
Montana-Tonopah	888	28,510
Tonopah Extension	912	27,247
West End	590	19,799
Midway	80	260
MacNamara	405	10,477
North Star	.....	80
Totals	8,475	236,468
Estimated value	$211,875	.....

Montana-Tonopah—The company has made the final payment of $59,375 on the Commonwealth mine, at Pearce, Ariz., on which it will immediately install a 300-ton mill of 30 stamps, with two Hardinge and two tube mills and a complete cyanide plant, at an estimated cost of $200,000. This will be paid for by an issue of bonds for $250,000, running for five years and bearing 7% interest, the latter guaranteed by the Montana-Tonopah Mines Co. According to the report of Llewelyn Humphreys, the mine shows ore reserves of 314,545 tons of a gross value of $1,969,730 and a net profit of $955,667.

Tonopah Mining—During June, 14,551 tons were milled, of an average grade of $18.95 per ton. The net profit was $151,389.

Tonopah-Belmont—The report for June states that 7370 tons were milled, of a net value of $204,602. The net profits were $125,525. Development work has been resumed on the Lillie Belle and Del Monte veins. The main shaft will be sunk to the 14th level.

Tonopah-Cash Boy Mining Co.—This company, owning the Cash Boy claim, adjoining the Tonopah Merger on the west, has granted to the Tonopah Leasing & Mining Co., of which W. S. McCornick, banker of Salt Lake City, is

president, a three-year lease on the property. The shaft is down 500 ft. and sinking will be resumed.

Tonopah Extension—The cleanup at the 30-stamp mill for June shows that 4476 tons of ore were treated, an average of over 149 tons per day, resulting in 48 bars of bullion worth about $61,144, the extraction averaging 93% of the assays. In the mine, the main orebody on the 500-ft. level has widened and in the east stope is 45 ft. wide of milling grade.

New Mexico

Deadwood—On July 5, the shafthouse and gallows frame were destroyed by fire and the machinery considerably damaged. Work on a new structure was started at once and underground work will be resumed soon. A 50-hp. gasoline engine is being added to the mill power plant. The last cleanup in June produced 4000 oz. of bullion and 1½ tons of concentrates.

Socorro—Special orebins are being erected for custom ore that will be delivered from adjacent claims. The mill is operating regularly with a capacity of about 175 tons per day.

New York

Press dispatches state that a large gas well was struck recently on the Andrew Orvis farm, in Orchard Park Valley, by a company in which Buffalo men are interested.

Oregon

A railroad to cost $1,000,000 and to extend 52 miles up the Applegate River from Grant's Pass, has been financed and authorized by the owners of the copper mines in the Blue Ledge district. The contract for the rails has been let, the final survey is to be made soon and the contract for the construction is to be let.

Poller—E. O. Poller and associates, owning this mine near Blue River postoffice, recently installed a 2-stamp Nissen mill. It is not operating satisfactorily as the gold is in the sulphides. The ore is too low grade to ship.

Lucky Boy—This mine, owned by Portland men, is reported to have been sold to Twohy Brothers, railroad contractors, who will develop it. The mill and electric plant are in good condition.

South Dakota

Evans Consolidated—The reports of officers, given at the annual meeting, showed that during the year $12,000 were spent on development and that the mine is nearly ready for a mill.

Wasp No. 2—At the annual meeting, held recently, the board reappointed John Gray general manager. The property operated steadily during the year, excepting 40 days in January and February, lost on account of severe weather. During the six months ended July 1, the mine produced 66,020 tons of ore, from which $141,163 were recovered. Dividends amounting to $60,000 were paid during that period.

Victoria—The company announces that it is about ready to start milling. The officials state that there is a supply of good milling ore, sufficient to keep the plant busy for some time. The ore yields a high recovery by cyaniding after coarse crushing. The mill is equipped with Gates crushers and rolls, and has a leaching capacity of 200 tons per day. O. N. Brown, Deadwood, S. D., is superintendent.

Utah

Beaver County

June shipments amounted to 47 cars, of an estimated value of about $28,000. This does not include shipments from the South Utah and the Horn Silver.

Red Warrior—Good lead-silver ore is being shipped from below the 550-ft. level.

Moscow—Four cars of ore were shipped recently and the reserves are being increased.

Majestic—June shipments from the Old Hickory amounted to 16 cars, with 10 to 12 more cars ready for shipment at the end of the month. Shipments were kept back by haulage difficulties. Arrangements are being made to reduce the wagon haul to the railroad from about four miles to half a mile. Two shifts are being worked, and a third is to be added soon. A new compressor is being installed and electricity will be furnished by the Beaver River Power Co., replacing gasoline power. At the Harrington-Hickory, a west drift on the 550 level is 290 ft. long, and the fissure is still strong. Development work only was done in June, and no shipments were made.

Rob Roy—A shipment of good ore is being prepared for the market.

Juab County

Tintic shipments for the week ended July 12 amounted to 170 cars.

Gold Chain—The payment of the recent dividend will leave more than $50,000 in the treasury. The present output is 100 tons per day.

Swansea—This company has been shipping steadily since January, beginning then with a weekly average of three-fourths of a car. The output for the week ended July 12 was eight cars. Most of the ore is coming from the 940-ft. level. The 800 is also producing, and the ore there is of a better grade than that on the 940. A new electric compressor has been installed.

Iron Blossom—Foundations for the new hoisting equipment for the No. 1 workings have been completed, and lumber for the new shafthouse, etc., has been delivered. Most of the equipment is on the ground. Drifting has been started on the 700-ft. level of the No. 1 workings to reach the body of copper ore opened recently on the 600. The face of the drift is mineralized with copper. The output for the week ended July 12 was 25 cars.

Opohongo—The drift to the south on the 600-ft. level, being driven for the ore opened from higher workings, is thought to be within 100 ft. of its objective point. Shipments for the week ended July 12 amounted to four cars.

Beck Tunnel—Two cars were shipped during the week ended July 12, and the company is making expenses. A drift is being driven south on the 175-ft. level to connect with a stope above, and indications are encouraging.

Uncle Sam—A special stockholders' meeting is called for Aug. 7, to consider increasing the capitalization from $500,000 to $750,000. It is understood that the 250,000 additional shares will be used in acquiring mining property.

Canada

Alberta

Western Canada Natural Gas—This company's pipeline from Bow Island to Calgary has been completed. It is 181 miles long. The contractors, Corcoran & Co., of Pittsburgh, commenced work three months ago. The expenditure was approximately $3,000,000. The company, which includes local and English capitalists, will supply natural gas to Calgary.

British Columbia

Red Cliff—This company, in the Portland Canal district, has commenced shipping copper-gold ore to the Tyee Copper Co.'s smeltery, at Ladysmith, Vancouver Island. About 700 tons of ore are being shipped. This is the first crude ore to be shipped in quantity from that district.

Motherlode-Sheep Creek—The company, with William Watson, New York, as manager, has commenced crushing ore at its new mill, in Sheep Creek camp, Nelson mining division. The mill equipment was put in under the supervision of C. W. Merrill.

Richmond—This group is under bond to Joseph L. Warner for $50,000. He has organized a syndicate of Vancouver men. Work has been resumed in the shaft. It is the intention to install a power plant consisting of an air compressor, hoist and pump, to be driven with electric

power from the West Kootenay Power & Light Company.

Phoenix—Matt Trewhella has leased this property, which has been idle for many years, and has uncovered a small vein carrying gold and copper. A shipment of 15 tons was sent to the Trail smeltery recently.

ONTARIO

Fidelity Copper Co.—W. G. Colwell, of Buffalo, is planning to resume work on this property, 12 miles north of Sturgeon Falls.

Macgowan—The mine at Parry Sound, from which considerable rich copper ore was shipped several years ago, has been sold for taxes.

Shakespeare—This low-grade gold mine at Webb, west of Sudbury, which has been under option to a French syndicate for some time, has reverted to the local company. Considerable development has been done.

ONTARIO-COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended July 19, and for the year to date, are:

La Rose	62.63	1,954.20
Coniagas	.....	1,143.63
O'Brien	.....	276.23
Right of Way	26.55	180.01
Chambers-Ferland	31.55	257.05
McKinley-Darragh	61.36	1,519.22
Nipissing	75.03	1,235.63
Hudson Bay	.....	408.27
Buffalo	28.18	697.25
Crown Reserve	.....	302.08
Cobalt Townsite	43.00	853.68
City of Cobalt	.....	812.51
Tretheway	.....	283.54
Colonial	.....	41.60
Kerr Lake	.....	424.14
Cobalt Lake	57.55	399.24
Drummond	.....	330.30
Timiskaming	32.55	619.46
Beaver	.....	180.90
Wettlaufer	.....	111.21
Provincial	.....	22.22
Casey Cobalt	.....	212.15
Lost and Found	.....	15.00
Totals	418.40	11,923.03

Wettlaufer-Lorrain—During the quarter ended June 30, the mill treated 4166 tons of ore, yielding $120,787. Costs were $49,050 and profit, $71,737. No new orebodies were found in the Silver Eagle claim. A Huntington mill for regrinding jig tailings has been installed and is doing well.

Gould Consolidated—This company has entered into a contract with the Porcupine Syndicate, Ltd., under which the latter will work the property of 120 acres held by the Gould under lease from the Peterson Lake. The Porcupine Syndicate will continue development at the 100-ft. level and will open on a lower level the veins encountered in the present workings, which are believed to be continuations of some of the Nipissing veins.

McKinley-Darragh—The output for the first six months of 1912 was 1,530,000 oz. of silver. Work will be started immediately on the aërial tramway, 5000 ft. long, over which ore will be brought from the Savage mine to the McKinley mill, which will reduce operating costs.

Timiskaming—The financial statement, as of June 30, showed: Cash in bank, ore on hand and money due from the smelters, $459,426.

Rochester — The shareholders have ratified a bylaw for the formation of a holding company. It is proposed to organize a new company with a capitalization of $1,000,000, stock being allotted to present shareholders in the proportion of one new share to four of old stock. The new corporation will assume the debts and endeavor to raise funds by selling stock.

ONTARIO-PORCUPINE

McEnaney—The erection of a 5-stamp mill has been definitely decided upon.

McIntyre—This company has ordered a 100-ton cyanide plant, to treat the ore from No. 5 shaft, which is not amenable to amalgamation and concentration. The second payment of $50,000 has been made on the property.

Alexo—This company will commence shipping nickel ore to the Mond smeltery. Shipments at first will consist of three cars per week and will be gradually increased to one car per day. The ore will probably average about 5% nickel and 0.5% copper.

Goldfields Limited — A development fund of $40,000 has been raised to carry on work at this Larder Lake mine.

Hollinger Reserve—Three veins have been cut on the 100-ft. level and the company is considering the erection of a small mill.

Dane—The two shafts at this copper mine are now down over 100 ft. Some ore running as high as 18% copper has been encountered.

Silver Lake—Five veins of calcite and niccolite have been uncovered at this Elk Lake mine. On one of these, five testpits were put down, all showing silver ore.

ONTARIO—SUDBURY

North Star—The nickel mine, in Snider Township, near the Creighton mine, owned by the Mond Nickel Co., will be reopened and operated to supply the new smeltery at Conniston. The ore runs higher in nickel than the average of the south range ores.

Murray—Drilling will be resumed on this property, near Sudbury, by Smith & Travers, for the Dominion Nickel-Copper Co., as soon as the title papers are signed. The smelting plant at the mine has been dismantled. The property was sold for $125,000.

Canadian Copper Co.—This company has taken an exploration option on Lot W. D. 38, in Bowell Township, and Clear Lake, in Capreol Township, from W. McVittie, of Sudbury. The company has recently indicated a policy of expansion in the matter of acquiring new properties in the district.

Mexico

CHIHUAHUA

Dolores—Rebels recently are reported to have commandeered 80 of the company's pack mules.

MEXICO

Esperanza—During June the mill crushed 8682 tons of ore and 3191 tons of tailings. Total receipts were $89,123; expenses, $14,374; estimated profit, $13,097. No ore was mined from the San Carlos vein, pending a connection between shafts. Development work totaled 512 feet.

SAN LUIS POTOSI

W. H. Simpson is working his claim, situated near the San Diego mine.

San Sebastian—This mine is being worked on a small scale, producing ore containing about 3½% copper and 350 grams of silver.

SONORA

Greene-Cananea—The company is reported to have readjusted its wage scale by doing away with the premium system and reducing the working hours from 9½ to 9 hours, without change of pay. Hereafter all employees will receive 3.50 pesos per day.

Lucky Tiger - Combination — During June the mills crushed 5676 tons of ore and the cyanide plant treated 5439 tons of tailings from the two mills and 2081 tons from the old tailings dumps, an average of about 250 tons per day. The bullion produced was worth $64,877; concentrates, $57,932 and 110 tons of shipping ore, $27,010; total, with sundry profits, $153,336. Expenses were: Mining, including development, $20,469; milling, $33,468; other expenses, $31,656 Estimated profit for the month was $64,597; development work amounted to 267 feet.

Africa

TRANSVAAL

It is reported that gold-bearing quartz has been found in a reef under the city docks, at Cape Town. The man who discovered it is said to have worked on the docks more than 18 years ago.

Gold production from the Witwatersrand in June was 722,588 oz., and from the outside districts 31,348 oz.; a total of 753,936 oz., being 25,726 oz. less than in May. For the six months ended June 30, the total output was 3,896,147 oz. in 1911, and 4,544,907 oz.—or $93,943,228—in 1912; an increase of 648,760 oz. this year. The companies holding reserves report 8983 oz. at the end of June. The number of negro laborers employed on June 1 was 212,573, a decrease of 4254 men from the May report.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, July 24—The coal markets generally show little change. In the West business seems to be improving, and consumers are beginning to consider the putting in of stocks more freely. The Lake trade is suffering from the usual congestion at the upper ports.

The seaboard bituminous trade is still slow, but supplies are not as excessive as they have been.

The anthracite trade is rushing and the companies are behind in deliveries. They have not yet made up the shortage caused by the April and May suspension, and many orders are pressing.

Coal and coke carried on Pennsylvania R.R. lines east of Pittsburgh and Erie, six months ended June 30, short tons:

	1911	1912	Changes
Anthracite	6,035,900	4,572,269	D. 1,463,631
Bituminous	19,748,713	22,519,781	I. 2,771,068
Coke	5,248,549	6,374,293	I. 1,125,744
Total	31,033,162	33,466,353	I. 2,433,181

Total increase this year, 7.8%. The decrease in anthracite was due to the stoppage of mining in April and May.

Coastwise shipments of coal from chief Atlantic ports, six months ended May 31, long tons:

	Anthracite	Bituminous	Total
New York	5,763,455	4,928,499	10,691,954
Philadelphia	664,305	1,917,032	2,581,337
Baltimore	69,758	1,534,639	1,604,397
Newport News	.....	1,245,180	1,245,180
Norfolk	.....	2,133,754	2,133,754
Total	6,497,518	11,759,104	18,256,622
Total, 1911	7,919,353	10,807,863	18,727,216

Total decrease this year, 470,594 tons, the loss being wholly in anthracite. New York covers all the harbor shipping ports.

The Southwestern Interstate Coal Operators' Association reports shipments as follows for the four months ended Apr. 30, in short tons:

	1911	1912	Changes
Missouri	822,259	1,142,277	I. 320,018
Kansas	1,579,236	1,928,482	I. 349,246
Arkansas	481,465	614,884	I. 133,419
Oklahoma	757,786	1,092,575	I. 334,789
Total	3,590,746	4,778,218	I. 1,187,472

Total increase this year was 36.4%. These shipments cover over 90% of the coal mined in the states named.

Iron Trade Review

New York, July 24—Very little change is evident in the position of the iron and steel markets. Business continues active for a midsummer month, and prices hold up to the recent advances, with a firming up in several minor lines. There is beginning to be some complaint about slowness in deliveries, and some mills have trouble in keeping up to the dates specified.

Railroad business is good, a number of orders being reported for new cars, locomotives and bridges. Small orders for rails are still coming in. There is a demand for plates and sheets, and structural steel is also called for in new orders. Steel billets are in demand,

The volume of specifications for steel products has increased somewhat since last report, and the average of the month thus far is practically up to that of the same period in June, which is a great deal more than producers expected. The market is strong and shows signs of stiffening too rapidly. Mills have been falling behind in deliveries, and this prompts buyers to place specifications farther ahead, so that the situation begins to take on the aspect which prevailed in the summer of 1909. That movement went too far, and became topheavy, and predictions are now being made in some quarters that there will be a runaway market again. While the movement thus far has been legitimate, there is always the danger of speculative buying when prices advance steadily and rapidly, as there is danger of their continuing to do. Already there are rumors that an advance may occur in bars, plates and shapes within a fortnight, and there has been some contracting for fourth quarter, prompted by the fear of such an advance. On the whole, however, contracting has been light in July.

Inquiries are reported for some large lots of pig iron, and there is a steady run of small sales. Some furnaces in the East have advanced prices 25c. per ton, and Southern iron is firmer than it has been. Pig-iron stocks are now pretty well down to a normal level.

Baltimore

July 22—Exports for the week included 2,001,040 lb. steel billets to Liverpool; 383,140 lb. steel plates to Rotterdam. Imports included 11,174 lb. bar iron from Sweden; 6314 tons iron pyrites from Huelva, Spain; 10,500 tons iron ore from Cuba.

Birmingham

July 22—Southern pig-iron market conditions are satisfactory despite the fact that the active buying movement expected is lagging a little. There are some sales being made right along and quotations are firm at $11.50@12 per ton for No. 2 foundry, delivery during the third and fourth quarters of the year. There is inquiry in hand for a large quantity of iron for delivery during the latter part of the year but the manufacturers are holding firmly to $12 per ton. The cast-iron pipe companies will have need for much iron through the balance of the year. The Central Foundry Co. will be at pipe making again shortly while the North Birmingham Dimmick plant is nearing completion.

In steel there is more business on the books at the rail mill at Ensley than ever before at this time of the year. There is a fairly good demand for steel wire goods and the announcement is made that there will be repairing done at the plant of the Southern Iron & Steel Company at Gadsden only where it is found imperative.

The pig-iron production has been improved a little this month by the blowing in of one furnace. Two others are being put in shape but will hardly start up until next month. Accumulated stocks are going down rapidly. The Sloss-Sheffield Co. holds more iron in its yards than all the other companies in the South combined, but is moving out its product by degrees and at the same time rushing the work of repairs on two of its blast furnaces.

Charcoal iron holds its own. The make is small and the price above $22 per ton.

Chicago

July 23—The iron market continues strong as regards both pig iron and finished products. Northern No. 2 foundry iron is held firmly at $15 furnace, as a minimum for general last-half requirements; Southern No. 2 foundry is held at $12 Birmingham or $16.35 Chicago. At these prices Northern has the advantage and is more in demand, but furnace agents manifest no anxiety to sell. The anxiety is being manifested by the melters, sales and inquiries being more numerous. Though the greater part of the business is in small lots, some sales of over 1000 tons have been made in the last week and there are many inquiries for larger tonnage. Contracts are being made for deliveries up to the end of the year and there is some inquiry about 1913 supplies, but the prices quoted are high and there is no disposition yet on either side to go beyond the calendar year. Charcoal iron, though having a fair sale, has not shared the rising move-

ment and continues to be firm at $15.75, Chicago.

Advancing prices have checked but slightly the demand for iron and steel products. Structural material continues to show a large number of contracts for the week, both local and western requirements being heavy. Railroad supplies are steadily in demand, and some large needs are being figured on in addition to a big aggregate of smaller orders; the mills are filled with business on standard rails. The bar market is strong as regards steel and iron bars. Plates and sheets have a very good sale; there is no evidence of dullness anywhere.

Cleveland

July 22—Shipments of iron ore have been delayed a little by bad weather and slow movement of boats.

Pig Iron—There is a steady run of small sales. Prices are firmer. Quotations, Cleveland delivery, are $15.15@15.25 for bessemer, $13.75@14 for No. 2 foundry, $17.50@18 for Jackson County silvery.

Finished Material—Demand is active on almost all lines and the recent advances in quotations are well maintained. Complaints are made that mills are falling behind in deliveries on contracts.

Philadelphia

July 24—Prices are nominally higher than a week ago. An early adjustment of the coke dispute is looked for but only trifling reductions are expected. This hope explains partly the falling off in business and inquiries for late deliveries. Makers are not trying to secure contracts and are serenely satisfied with the drift of things. The melting of pig is increasing in all channels of consumption and the disposition to buy for forward requirements is manifest, though held in check by an upward tendency which is not regarded as warranted. Considerable business has been closed in this market within a few days. Most of it has been hanging fire for two or three weeks. Foundry No. 2 X is strong. Low grade irons are under inquiry from large cast-iron concerns which have recently booked additional orders. Forge is $15; No. 2, $15.50@16; basic $16, which can be shaded.

Billets—Small orders for both open-hearth and forging billets are coming along and another advance is pending.

Bars—The pressure for early deliveries on the part of small buyers and jobbers is felt at most mills for refined.

Sheet—The advanced price is easily held and the mills are full of work.

Pipes and Tubes—Tubes have been in very good demand all this month at top prices. Pipe is strong.

Plates—Congested conditions exist. Manufacturers are unable to comply with all the conditions asked as to delivery. In several instances premiums have been paid and it looks as though premium prices for early delivery would be the rule soon. The volume of prospective business threatens to swamp the mills for a while.

Structural Material—An improvement is reported on late delivery work, extending to the end of the year. The flow of inquiries is constant.

Scrap—Sales are large and all good lines of scrap are disappearing. In some cases consumers have given instruction to dealers to gather up certain kinds of scrap for fourth-quarter delivery.

Pittsburgh

July 23—Under date of July 20 the American Steel & Wire Co. advanced its prices $1 a ton, making plain wire 1.45c., wire nails $1.65, painted barb wire 1.65c., galvanized barb wire 1.95c. and galvanized smooth wire 1.75c. The advance was promptly followed by the independent producers. It will doubtless have the effect of eliminating shipments on old contracts carrying a base price of $1.50 for nails, and throw shipments into the $1.55 and $1.60 prices. Demand is light, but is regarded as good for the time of year.

Pig Iron—The local pig-iron market is firm but quiet. It appears that the furnaces now operating have little iron to sell for the next few months, and are not interested in putting up prices in the circumstances, when advances might tempt other furnaces to get into blast. We quote: Bessemer, $14.25@14.50; basic, malleable and No. 2 foundry, $13.50; forge, $13@13.25, all at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—Interest is beginning to develop in ferromanganese for first-half delivery, and several inquiries are out from steel mills for round tonnages. Prompt metal is not in particular demand, and does not bring any higher price than forward. We quote 80% at $48.50, Baltimore.

Steel—The steel situation has become a trifle stronger. Most of the mills are entirely out of the market for this quarter, and do not care to name prices for fourth quarters. Some of the mills are ready to sell small tonnages for early delivery, as they can spare the material. Prices are not materially changed and we quote: Billets, $21.50@22; sheet bars, $22@22.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are $25, Pittsburgh.

Sheets—The market has been stiffening since the advance by the leading interest a week ago. The lowest prices made by independents have disappeared, and the market has moved about half way toward covering the advances made by the leading interest, $2 in black sheets and $3 in galvanized. Specifications are good and some new contracts are being entered. The leading interest is operating about 85% of its sheet mills, having a few mills off here and there for repairs. The independents are doing more repair work, and are operating at between 65 and 75% of full capacity. In another fortnight the mills will probably be through with repair work and will be running full again. We quote: Blue annealed, 10-gage, 1.45c.; black sheets, 28-gage, 2@2.05c.; galvanized, 28-gage, 3.05@3.15c.; painted corrugated, 2.20@2.25c.; galvanized corrugated, 3.10@3.20c. per lb., Pittsburgh.

Connellsville Coke—A split has occurred in the ranks of the Connellsville coke interests who were asking a uniform price of $2.50 for furnace coke, either prompt delivery or on contracts through the half year. A party of operators is offering coke through a Uniontown brokerage house to furnaces, and it is understood its ideas are $2.50 for prompt and $2.35 for contract. A Pittsburgh firm which was greatly interested in the movement and controls a large tonnage of coke is offering prompt at $2.25 and would probably close a few contracts at the same figure. The differences arose from a variety of causes, including dissatisfaction on the part of some experienced sellers with the flat price of $2.50 when there are differences in the value of different brands of Connellsville coke, even though regarded as standard. The market is quiet at the moment, the break having come very suddenly at the beginning of this week. Prompt coke has sold in a limited way at $2.20, at ovens.

St. Louis

July 22—The pig-iron market is dull at present with very few contracts being closed. Buyers do not seem inclined to purchase heavily, though the price of $11.25@11.50 Birmingham is still being held. This price will probably be shaded 50c. on a fairly large contract. The current quotation is $11.25 Birmingham or $15 St. Louis for No. 2 foundry. The market is also dull for Northern iron and the price of $15.75 St. Louis, prevails.

Good foundry coke is quoted at $5.65 St. Louis.

Iron Ore Trade

A 25-ft. vein of iron ore has been discovered in sections 34 and 33, township 27 north, range 6 west, in the southeast corner of Eau Claire County, Wis. The vein now discovered is in the southern part of Seymour township, north of the Eau Claire River, and between Hay River and Muskrat Creek. Four shafts are now being dug to a depth of 50 ft. The ground is north of that which was explored and abandoned by the Augusta Mining Co. many years ago.

British Imports— Imports of iron ore in Great Britain six months ended June 30, were 3,513,214 long tons in 1911, and 2,916,538 in 1912; decrease, 596,676 tons.

Imports of manganese ore, 181,550 tons in 1911, and 145,493 in 1912; decrease, 36,057 tons.

Sault Ste. Marie Canal Traffic

Freight passing through the Sault Ste. Marie Canals in June was 10,747,159 short tons, being 1,810,466 tons over May. For the season up to July 1 the total freight was, in short tons:

	1911	1912	Changes
East-bound	9,624,131	15,329,385	I. 5,705,254
West-bound	4,769,561	4,521,385	D. 248,176
Total	14,393,692	19,850,770	I. 5,457,078

The number of vessel passages this year was 6783, showing an average cargo of 2927 tons. The mineral freights included in the totals were, in short tons except salt, which is given in barrels:

	1911	1912	Changes
Coal	4,209,282	3,940,305	D. 268,977
Iron ore	8,250,823	12,928,232	I. 4,677,409
Pig and mfd. iron	128,148	197,811	I. 69,663
Copper	38,181	30,689	D. 7,472
Building stone	1,352	2,282	I. 930
Salt, bbl	236,477	295,687	I. 59,210

Iron ore was 65.1% of the total freight, and coal 19.8% this year.

Foreign Iron Trade

German Production—The German Iron Trade Union reports the make of pig iron in the German Empire in May at 1,463,610 metric tons, 36,051 tons more than in April. For the five months ended May 31 the total was, in metric tons:

	1911	1912	Changes
Foundry iron	1,293,451	1,290,193	D. 3,258
Forge iron	233,307	229,773	D. 3,534
Steel pig	706,176	848,682	I. 142,506
Bessemer pig	142,878	163,274	I. 20,396
Thomas(basic)pig	4,043,830	4,474,198	I. 430,368
Total	6,419,642	7,006,120	I. 586,478

Total increase this year 9.1%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

Metal Markets

New York, July 24—The metal markets have been fairly active and prices are firmer in several lines.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
June 1912	$ 7,149,035	$ 5,611,057	Exp. $1,537,978
" 1911	3,074,755	4,767,714	Imp. 1,692,959
Year 1912	33,374,836	25,264,342	Exp. 8,110,494
" 1911	13,251,562	33,773,026	Imp. 20,521,464
Silver			
June 1912	5,045,944	4,879,485	Exp. 166,459
" 1911	5,777,703	3,506,446	Exp. 2,271,257
Year 1912	33,668,972	25,264,249	Exp. 8,404,723
" 1911	34,443,203	21,960,601	Exp. 12,482,602

Exports from the port of New York, week ended July 20: Gold, $62,600; silver, $1,248,909, chiefly to London. Imports: Gold, $371,998; silver, $136,561, principally from Mexico and South America.

Gold—The price of gold on the open market in London remained at the bank level, 77s. 6d. per oz. for bars and 76s. 4d. per oz. for American coin. Outside of India there was no special demand.

Iridium—The current price on this metal continues at $63 per oz., New York.

Platinum—The market is rather quiet, as is usual at this season. Prices are unchanged, dealers asking $45.50 per oz. for refined platinum and $48 per oz. for hard metal. The foreign market is reported firmer.

Silver—The market has ruled quiet and steady, fluctuating between 27 13/16 and 27 15/16 d. in London. The Chinese loan negotiations continue at a deadlock, but the Monsoon reports are favorable, and the Indian currency reserves reveal a decrease of 10 lakhs in the total of silver rupees and an increase of 19 lakhs in that of gold. The market is likely to remain steady for the present.

SILVER AND STERLING EXCHANGE

July	18	19	20	22	23	24
New York	60 5/8	60 5/8	60 1/2	60 3/4	60 3/4	60 5/8
London	27 7/8	27 13/16	27 7/8	27 13/16	27 13/16	27 7/8
Sterling Ex.	4.8735	4.8740	4.8750	4.8750	4.8765	4.8765

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver. 0.925 fine.

Shipments of silver from London to the East, Jan. 1 to July 11, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India	£4,487,000	£3,677,200	D. £ 809,800
China	890,400	933,500	I. 43,100
Total	£5,377,400	£4,610,700	D. £ 766,700

Messrs. Samuel Montagu & Co. write from London: "The net import of gold into India for the month of June was £2,868,333, approximately. This makes a total for the first six months of the year of £19,500,000. The figures are striking when compared with £20,909,000, the net import during the whole of 1911, exactly double the period. Of this £19,500,000, over £9,000,000 swells the total of gold held by the Indian Treasury against the note issue, leaving £10,500,000 to be accounted for. At least £4,800,000 of this residue was received in the form of bar gold."

Total imports of gold in Great Britain five months ended May 31 were £20,316,524 in 1911, and £21,122,640 in 1912; exports, £13,319,365 in 1911, and £16,182,160 in 1912; excess of imports, £6,997,159 in 1911 and £4,939,962 this year.

Total imports of silver in Great Britain five months ended May 31 were £6,244,061 in 1911, and £6,146,914 in 1912; exports, £7,604,627 in 1911, and £6,146,844 in 1912; excess of exports in 1911 was £1,360,566 in 1911; excess of imports in 1912 was £101,070. Of the imports this year £4,938,979 came from the United States.

Imports of gold into France four months ended April 30, were 112,753,000 fr.; exports, 18,489,000 fr.; net imports, 94,364,000 fr., an increase of 87,824,000 fr. over last year.

Foreign trade of the United States, six months ended June 30, as valued by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise	1911	1912
Exports	$987,820,540	$1,099,515,882
Imports	763,745,950	884,812,966
Excess, exports	$224,074,590	$214,702,916
Add excess of exports, silver		8,404,723
Add excess of exports, gold		8,110,494
Total export balance		$231,218,133

The gold and silver movement in detail is given in the table above.

Copper, Tin, Lead and Zinc

NEW YORK

July	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
18	17 @17 1/8	17.00 @17.10	43 5/8	4.75	4.60 @4.62 1/2	7.15 @7.20	7.00 @7.05
19	17 1/8 @17 1/4	17.10 @17.20	43 1/2	4.70 @4.75	4.60 @4.62 1/2	7.15 @7.20	7.00 @7.05
20	17 1/4 @17 1/4	17.10 @17.20	43 1/2	4.70 @4.75	4.60 @4.62 1/2	7.15 @7.20	7.00 @7.05
22	17 3/8 @17 3/8	17.30 @17 40	43 7/8	4.70 @4.75	4.60 @4.62 1/2	7.15 @7.20	7.00 @7.05
23	17 3/8 @17 5/8	17.45 @17.50	43 7/8	4.70 @4.75	4.60 @4.62 1/2	7.15 @7.20	7.00 @7.05
24	17 3/8 @17 5/8	17.45 @17.50	43 3/4	4.70 @4.75	4.60 @4.62 1/2	7.15 @7.20	7.00 @7.05

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

July	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
18	76 3/8	77	81 1/4	199 1/4	197 1/4	18 5/16	26 1/4
19	77 1/16	77 1/16	82 1/2	198 1/2	195 3/4	18 1/2	26 1/4
20	....	....	....	.....	.....	....	....
22	78 11/16	78 3/4	83 3/4	199 3/4	197	18 1/2	26 1/4
23	79	78 3/4	84	199 1/4	196 3/4	18 1/2	26 1/4
24	78 1/2	78 1/4	83 3/4	199	196 1/4	18 5/16	26 1/4

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

Copper—There has been a better demand for copper both in this country and in Europe, and it appears that refined

copper in the hands of speculators and dealers has been pretty well cleared out; and that further supplies will have to be obtained from the larger producers who did not follow the decline, but right along held at 17¾c., usual terms. With the advance in London the opportunity for profitable arbitrage transactions disappeared. Under these circumstances the market here advanced rapidly upon relatively small transactions. There has been talk in the newspapers of large business at 17¾c., but we have had no authentic reports of such, and copper has been liberally offered and sold by first hands at 17⅝c. delivered, usual terms, during the latter part of the week. The business in Lake copper that has been reported has been relatively small in volume and the quotations are more or less nominal. At the close Lake is quoted at 17½@17⅝c.; electrolytic in cakes, wirebars or ingots at 17.45@17.50c. Casting copper is quoted nominally at 17@17¼c. as an average for the week.

The market for standard copper was up to £77 13s. 9d. for three months, on Friday, July 19, but since then has been reactionary again, and it has been reported that short selling for account of renewed bear operators is the cause of this.

It is furthermore noteworthy that the usual contango between spot and three months' copper has entirely disappeared, both spot and three months being quoted £78 2s. 6d. at the close. Our London cables explain that this seems to be due to the fact that the buyers on the previous account have been covering their near-by dates, while the new bears are selling three months.

Copper sheets are 22@23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 5874 long tons. Our special correspondent reports the exports from Baltimore at 1701 tons.

Tin—The market is without special feature and has fluctuated within narrow limits. Abroad there was some pressure on the London market, evidently due to the Banka sale. Tin for most deliveries has ruled between about 43½@43⅞, and closes at 43¾ cents.

The London market, which opened on July 18 at £199 5s. for spot and £197 5s. for three months, closed on July 19 at £198 10s. for spot and £195 15s. for three months. On July 22, 23 and 24 it held around £199 7s. 6d. for spot and £196 15s. for three months, closing today at £199 for spot and £196 5s. for three months.

Lead—There is a fair business doing at slightly lower prices, 4.60@4.62½c. St. Louis and 4.70@4.75c. New York.

The London market is firmer, good Spanish lead being quoted £18 11s. 3d. and English lead 2s. 6d. higher.

Spelter—The demand for metal for immediate delivery has disappeared and consequently the premium. The business of the week has been in August-September contracts. Some of the principal buyers have been in the market and have taken a fair tonnage of metal at 7@7.05c., St. Louis. We quote, New York, 7.15@7.20c. and St. Louis, 7@7.05 cents.

The London market is firm at £26 5s. for good ordinaries and £26 10s. for specials.

Base price of zinc sheets is now $8.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb. in carload lots, New York.

Other Metals

Aluminum—Business has been active and sales good. Prices have advanced and No. 1 ingots are now quoted at 24@24½c. per lb., New York. The foreign market is also higher.

Antimony—Business continues active and sales are good. Stocks are now small and those of outside brands which have been held in second hands are pretty well cleaned out. The market is in a strong position and further advances are expected. Cookson's is firm at 8.25@8.50c. per lb. and Hallett's 7.87½@8c. For Chinese, Hungarian and other outside brands, 7.50@7.65c. per lb. is paid.

Quicksilver—Business is still rather quiet and there is no change reported in prices. New York quotations are $42.50 per flask of 75 lb., with 60@62c. per lb. asked for retail lots. San Francisco, $42 for domestic orders and $39.50 for export. The London price is £8 10s. per flask, with £8 7s. 6d. asked from second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, six months ended June 30, figures in long tons, except quicksilver, which is in pounds:

Metals	Imports	Exports	Excess	
Copper, long tons	61,130	26,981	Imp.	34,149
Copper, 1911....	74,309	40,704	Imp.	33,605
Tin, long tons....	21,571	22,044	Exp.	474
Tin, 1911.....	20,901	20,988	Exp.	87
Lead, long tons..	107,445	25,703	Imp.	81,742
Lead, 1911.....	106,922	33,761	Imp.	73,161
Spelter, l'g tons..	70,881	4,378	Imp.	66,503
Spelter, 1911....	67,623	5,247	Imp.	62,376
Quicksilver, lb...	3,199,124	1,003,798	Imp.	2,195,326
Quicksilver, '11	3,969,263	1,352,789	Imp.	2,616,474
Minor met's, tons	3,660	13,257	Exp.	9,597
Minor, 1911.....	2,750	10,829	Exp.	8,079
Ores				
Tin ore and con.	15,233	.....	Imp.	15,233
Tin ore, 1911...	14,929	.....	Imp.	14,929
Pyrites	455,502	.....	Imp.	455,502
Pyrites, 1911...	487,763	.....	Imp.	487,763

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Minor metals include nickel, aluminum and the minor metals and alloys.

Spanish Metal Exports

Exports of metals and minerals from Spain, four months ended Apr. 30, as reported by *Revista Minera*, in metric tons:

Metals	1911	1912	Changes	
Pig and manuf. iron	17,428	20,444	I.	3,016
Copper.....	3,770	6,971	I.	3,201
Copper precipitate..	4,898	3,689	D.	1,209
Lead.....	46,925	58,169	I.	11,244
Zinc.....	581	815	I.	234
Quicksilver.....	623	1,037	I.	414
Minerals				
Iron ore.....	2,978,486	2,882,106	D.	96,380
Manganese ore.....	11,573	10,063	D.	1,510
Copper ore.....	159,848	53,645	D.	106,203
Lead ore.....	917	1,127	I.	210
Zinc ore.....	50,275	43,524	D.	6,751
Pyrites.....	607,644	948,588	I.	340,940
Salt.....	179,745	193,484	I.	13,739

Pyritic ores are now classed as pyrites unless they carry 2.5% or over in copper. Last year the dividing line was 1% copper.

Zinc and Lead Ore Markets

Joplin, Mo., July 20—The high price of zinc-sulphide ore this week was $66; the base per ton of 60% zinc was $56@62.50. Zinc silicate sold at $30@32 per ton of 40% zinc. The average price, all

SHIPMENTS, WEEK ENDED JULY 20

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,405,730	.....	939,840	$158,162
Joplin.....	1,924,690	.....	219,070	64,312
Galena.....	817,110	.....	314,880	32,825
Duenweg.....	706,940	.....	35,990	21,916
Alba-Neck....	675,480	.....	.....	20,264
Granby	227,610	572,770	11,750	15,140
Miami.....	327,840	.....	210,640	14,304
Cave Springs.	361,750	.....	.....	10,490
Carl Junction	307,740	.....	.....	9,540
Oronogo.....	310,840	.....	.....	7,403
Jackson.....	232,930	.....	.....	6,754
Carthage.....	227,000	.....	.....	6,583
Spurgeon	.....	192,110	100,930	6,100
Springfield....	86,000	.....	.....	2,500
Badger.....	74,680	.....	.....	2,090
Wentworth...	62,310	.....	.....	1,806
Quapaw.....	63,410	.....	.....	1,711
Aurora.....	.....	81,190	.....	1,217
Totals.....	10,812,060	846,070	1,833,100	$383,117
29 weeks...	294,117,870	18,160,030	50,434,230	$9,170,705

Blende val., the week, $315,344; 29 weeks, $7,510,928
Calamine, the week, 13,310; 29 weeks, 271,411
Lead value, the week, 54,463; 29 weeks, 1,388,366

MONTHLY AVERAGE PRICES

Month	Zinc Ore: Base Price		Zinc Ore: All Ores		Lead Ore: All Ores	
	1911	1912	1911	1912	1911	1912
January.....	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February....	40.21	45.75	39.16	43 31	54.46	52.39
March.....	39.85	51.56	38.45	49.25	54.57	54.64
April.....	38.88	52.00	37.47	50.36	56.37	54.18
May.....	38.25	55.30	36.79	53.27	55.21	52.45
June.....	40.50	55 88	38.18	54.38	56.49	55.01
July.....	40.75	.....	38.36	.....	58.81	.....
August.....	42.50	.....	41.28	.....	60.74	.....
September..	42.63	.....	41.29	.....	59 33	.....
October.....	42.38	.....	40.89	.....	54.72	.....
November...	45.40	.....	43.25	.....	57 19	.....
December...	44.13	.....	40.76	.....	62.03	.....
Year.....	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

grades, was $56.38. The high price of lead ore was $61, and the average price, all grades, was $58.86 per ton.

The zinc-ore market was on another rampage this week and the strong competition between four or five of the heaviest buyers brought the base up to $62.50 on Friday, a price that few operators ever dreamed they would be able to sell zinc ore for a few months ago. The market is in a peculiar condition, and even higher prices are looked for next week.

Platteville, Wis., July 20—The base price paid this week for 60% zinc ore was $57@58. The base price paid for 80% lead ore was $58@59 per ton.

SHIPMENTS, WEEK ENDED JULY 20

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	689,500	.....	.....
Galena	561,050	167,000	.....
Platteville	552,690	.....	192,900
Shullsburg	545,500	112,830	.....
Hazel Green	460,000	60,000	.....
Benton	443,000	.....	396,800
Linden	223,650	63,490	80,000
Cuba City	158,920	50,000	.....
Harker	144,870	151,500	.....
Rewey	82,000	.....	.....
Total	3,861,180	604,820	669,700
Year to date	114,465,310	5,181,290	16,877,270

Shipped during week to separating plants, 2,324,120 lb. zinc ore.

Other Ore Markets

Zinc Ores—For Rocky Mountain blende of good quality, especially as to iron and lead contents, the current price, delivered at smelting works in Kansas and Oklahoma, is for the zinc contents, less eight units at the St. Louis price for spelter; with a deduction of $16 to $18 per 2000 lb. of ore.

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. of ore containing 60 per cent. of tungsten trioxide. For scheelite ore, 50c.@$1.50 per unit less. These prices are delivered.

Vanadium Ore—A recent quotation for vanadinite, containing at least 10%, is 75c. per lb. for the V_2O_5 in the ore.

Molybdenum Ore—Recent prices offered for molybdenite, carrying 25% MoS_2, are $25 per ton; for wulfenite, at least 25% MoO_3, $100 per ton, f.o.b. railroad.

Chemicals

New York, July 24—The general market remains quiet, but there is a fair amount of business for the season.

Arsenic—Prices are unchanged for spot white arsenic, $4@4.25 per 100 lb. being asked for early delivery. Futures are a shade lower, at $3.50 per 100 lb. Supplies are coming in more freely.

Copper Sulphate—Sales have been fair and the market is still quiet. Quotations are unchanged at $5.50 per 100 lb. for carload lots and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is quiet but firm, and prices are a shade better, 2.45@2.50c. per lb. being asked for both spot and future positions.

Mining Stocks

New York, July 24—On July 18, there was some activity on the Exchange, and prices advanced. The Curb was quiet and rather irregular, Cobalts were steady and other mining stocks firm, but slow. Copper stocks were fairly active.

July 19 the Exchange was active, with more advances. The Curb was again irregular but more active. Braden Copper advanced, but British Columbia was off a fraction. Motherlode and Tonopah Extension sold freely at advances. Lehigh Valley Coal Sales also gained several points.

July 20 the Exchange was quiet. The Curb was more active, but copper stocks were inclined to be weaker. Diamond Black Butte, Tonopah Extension and West End Extension sold freely at advances.

July 22 the Exchange was rather slow, but firm. On the Curb mining stocks were rather quiet, except the coppers, which were strong and active. A feature of the dealings was the sale of 85,000 shares of Greenwater at 5c. per share.

July 23 and 24 the Exchange was rather unsettled and prices were weaker. Mining stocks on the Curb were quiet for the most part, but some coppers—notably Braden and Greene Cananea—advanced.

Sales of securities at auction in New York, July 18, included the following: Ontario Mining & Smelting Co., 4441 shares, $55 for the lot; New Central Coal Co., 15 shares, 37½% of par value; Comstock Tunnel Co., 200 shares, 10½c. per share, and $100 income bond scrip, $12; Columbus & Hocking Valley Coal & Iron Co., 3 shares, $1 for the lot; West End Furnace Co., Roanoke, Va., $100,000 first-mortgage bonds, $500 for the lot.

Boston, July 23—Although mining shares maintain a firm undertone midsummer inertia is manifest. Osceola took a $3 drop to $115 upon the announcement that the mine had to close down on account of the inflow of water, but quickly recovered when it was found that the damage was not as serious as first thought. Shannon and Arizona Commercial are conspicuously strong and active. Arizona Commercial has risen almost $1 during the week as a result of the successful reorganization of the company. The 6% bonds have risen 11 points to 86. Isle Royale sold up over $3 to $36.37½, which is its best price since 1907. U. S. Smelting has been particularly active and rose $2.50 to $46.50. Both Ahmeek and Calumet & Hecla show substantial advances.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	April	May	June
Alaska shipments	1,243,911	1,720,391	4,134,569
Anaconda	25,480,000	25,800,000	.....
Arizona, Ltd	3,400,000	3,500,000	3,300,000
Copper Queen	6,806,425	7,024,087	7,622,733
Calumet & Ariz	4,104,000	4,424,000	4,160,000
Chino	1,150,000	1,275,850	1,463,000
Detroit	2,506,718	2,092,478	1,959,634
East Butte	1,400,000	1,445,000	.....
Mammoth	1,718,450	.....	.....
Mason Valley	1,503,056	1,520,000	.....
Nevada Con	6,115,095	6,063,462	5,913,832
Ohio	675,000	.....	.....
Old Dominion	2,167,000	2,180,000	2,130,000
Ray	2,611,920	2,924,913	2,992,500
Shannon	1,544,000	1,464,000	1,270,000
South Utah	284,215	236,884	.....
United Verde*	2,250,000	2,500,000	.....
Utah Copper Co	8,615,775	9,564,919	8,772,742
Lake Superior*	18,250,000	21,250,000	15,600,000
Non-rep. mines*	7,625,000	8,400,000	8,300,000
Total production	97,400,495	.....	.....
Imports, bars, etc	26,842,014	25,836,519	.....
Total blister	124,242,509	.....	.....
Imp. in ore & matte	9,350,972	6,410,226	.....
Total American	133,593,481	.....	.....
Miami†	2,554,352	2,565,000	2,584,950
Brit. Col. Cos.:			
British Col. Copper	1,043,173	875,000	996,000
Granby	1,941,797	1,914,460	1,888,400
Mexican Cos.:			
Boleo†	2,149,280	2,260,160	1,851 920
Cananea	4,654,000	4,600,000	4,310,000
Moctezuma	2,797,718	2,892,521	3,176,819
Other Foreign:			
Cape Cop., S. Africa	954,240	754,880	.....
Kyshtim, Russia	1,545,000	.....	.....
Spassky, Russia	649,600	694,400	.....
Famatina, Argen	.....	.....	.....
Tilt Cove, Newf'd	119,869	123,087	.....
Exports from:			
Chile	6,496,000	3,696,000	9,856,000
Australia	9,408,000	7,840,000	8,176,000
Arrivals in Europe‡	12,064,640	9,976,860	12,667,200

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VI, 1911	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650

VISIBLE STOCKS

	United States	Europe	Total
VII, 1911	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698
IX	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,380
IV	62,367,557	136,819,200	199,186,754
V	65,066,029	134,176,000	199,242,089
VI	49,615,643	117,801,600	167,417,232
VII	44,335,004	108,186,000	152,521,047

Curb trading has been of fair volume with a firm list of prices. Nevada-Douglas is being quietly picked up around $3.50. Houghton touched $10 again, while there is a fair demand for First National and Davis-Daly.

Assessments

Company	Delinq	Sale	Amt
Belcher, Nev	Aug. 15	Aug. 30	$0.10
Buffalo, Mont	June 4	July 2	0.002
Challange, Nev	June 8	July 2	0.10
Chollar, Nev	July 7	Aug. 5	0.10
Confidence, Nev	July 15	Aug. 9	0.20½
Con. Imperial, Nev	July 28	Aug. 21	0.01
Con. Virginia, Nev	Aug. 11	Sept. 5	0.20
Crown Point, Nev	June 24	July 17	0.10
Gould & Curry, Nev	July 19	Aug. 12	0.05
Great Falls, Utah	June 26	July 27	0.002½
Hale & Norcross, Nev	July 2	July 29	0.05
Houghton Copper, Mich	May 17		1.00
Mineral Farm, Ida	July 15	Aug. 15	0.002
Mineral Hill, Nev	Aug. 5	Oct. 5	0.01
New Reliance, S. Dak			0.01
O. K. Silver Mining, Utah	July 15	Aug. 1	0.002½
Oreano, Ida	July 18	Aug. 19	0.001
Overman, Nev	June 29	July 23	0.10
Savage, Nev	June 4	June 26	0.10
Seven Troughs, Nev	June 15	July 2	0.002½
Sierra Nevada, Nev	July 4	July 30	0.10
Silver Mt., Ida	July 15	Aug. 15	0.002
Tintic Central, Utah	June 14	July 6	0.005
Union Consolidated, Nev	July 12	Aug. 7	0.15
Utah Antimony, Utah	June 1		0.03
Utah, Nev	July 12	Aug. 6	0.05
Yankee Con., Utah			0.02
Yellow Jacket, Nev	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630		25.034	24.286	
August	52.912	52.171		24.428	24.082	
September	53.295	52.440		24.567	24.209	
October	55.490	53.340		25.596	24.594	
November	55.635	55.719		25.680	25.649	
December	54.428	54.905		25.160	25.349	
Year	53.486	53.304		24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463		12.720		56.673	
August	12.405		12.634		56.266	
September	12.201		12.508		55.253	
October	12.189		12.370		55.170	
November	12.616		12.769		57.253	
December	13.552		13.768		62.068	
Year	12.376		12.634		55.973	

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	
February	41.614	42.962	August	43.319	
March	40.157	42.577	September	39.755	
April	42.185	43.923	October	41.185	
May	43.115	46.053	November	43.125	
June	44.606	45.815	December	44.655	
			Av. Year	42.281	

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499		4.397		13.530	
August	4.500		4.406		14.260	
September	4.485		4.356		14.744	
October	4.265		4.139		15.332	
November	4.298		4.181		15.821	
December	4.450		4.332		15.648	
Year	4.420		4.286		13.970	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695		5.545		25.006	
August	5.953		5.803		26.801	
September	5.869		5.719		27.750	
October	6.102		5.951		27.256	
November	6.380		6.223		26.795	
December	6.301		6.151		26.849	
Year	5.758		5.608		25.281	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90		14.03		14.53	
August	15.90		14.00		14.47	
September	15.90		13.57		14.40	
October	15.43		13.44		14.34	
November	14.92		13.30		14.25	
December	15.15		13.10		13.90	
Year	$15.72		$13.94		$14.49	

STOCK QUOTATIONS

COLO. SPRINGS July 23

Name of Comp.	Bid.
Acacia	.04¾
Cripple Cr'k Con.	.01½
C. K. & N.	.18¾
Doctor Jack Pot	.05½
Elkton Con.	.65
El Paso	.96½
Findlay	.04¼
Gold Dollar	.18
Gold Sovereign	.02
Isabella	.13¾
Jack Pot	.04
Jennie Sample	.05½
Lexington	‡.02
Moon Anchor	.0085
Old Gold	.03½
Mary McKinney	.69
Pharmacist	.01½
Portland	.91¾
Vindicator	.80
Work	.01½

SALT LAKE July 23

Name of Comp.	Bid.
Beck Tunnel	.10
Black Jack	.15
Cedar Talisman	.02
Colorado Mining	.18
Columbus Con	.25
Crown Point	.02¼
Daly-Judge	5.85
Grand Central	.55
Iron Blossom	1.20
Little Bell	‡.25
Lower Mammoth	.03
Mason Valley	13.00
May Day	.12
Nevada Hills	2.15
New York	.02½
Prince Con	1.57½
Silver King Coal'n	2.50
Sioux Con	.04½
Uncle Sam	.19
Yankee	‡.12

TORONTO July 23

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	‡7.35	Hollinger	12.25
Hudson Bay	‡70.00	Imperial	.01
Temiskaming	.37	Pearl Lake	.17
Wettlaufer-Lor	‡.56	Porcu. Gold	.31
Apex	.03	Porcu. Tisdale	.01
Central	‡5.56	Preston E. D.	.01
Crown Chartered	.09	Rea	.25
Dobie	‡.25	Standard	‡.01¼
Dome Exten	.13	Swastika	.09
Foley O'Brien	.15	West Dome	.10

SAN FRANCISCO July 23

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.10
Belcher	.50
Best & Belcher	.09
Caledonia	1.60
Challenge Con	.17
Chollar	.11
Confidence	.80
Con. Virginia	.48
Crown Point	.52
Gould & Curry	.07
Hale & Norcross	.18
Mexican	2.95
Occidental	.50
Ophir	1.12½
Overman	.90
Potosi	.03
Savage	.10
Sierra Nevada	.24
Union Con	.66
Yellow Jacket	.54

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	9.32½
Jim Butler	.69
MacNamara	.22
Midway	.63
Mont.-Tonopah	2.50
North Star	.23
West End Con	1.70
Atlanta	.31
Booth	.09
C.O.D. Con	.11
Comb. Frac	.18
Jumbo Extension	.41
Pitts.-Silver Peak	1.05
Silver Pick	.12
St. Ives	.33
Tramp Con	‡.01
Argonaut	‡2.00
Bunker Hill	‡4.50
Cent. Eureka	.42
So. Eureka	‡2.90

N. Y. EXCH. July 23

Name of Comp.	Clg.
Amalgamated	83¼
Am. Agri. Chem	61
Am.Sm.&Ref.,com	82⅜
Am. Sm. & Ref., pf.	107¾
Am. Sm. Sec., pf. B	87
Anaconda	41⅛
Batopilas Min	1⅝
BethlehemSteelpf	67⅛
Chino	31¾
Comstock Tunnel	‡.12
Federal M. & S., pf.	46½
Goldfield Con	4
GreatNor.,ore,ctf.	42
Guggen. Exp	55⅛
Homestake	96½
Inspiration Con	19
Miami Copper	29½
Nat'nalLead,com.	58¾
National Lead, pf.	108
Nev. Consol.	20¾
Pittsburg Coal, pf.	91½
Ray Con	20⅞
Republic I&S,com.	25½
Republic I & S, pf.	84¼
SlossSheffi'd,com.	55
Sloss Sheffield, pf.	97
Tennessee Copper	43½
Utah Copper	61⅞
U. S. Steel, com	69⅜
U. S. Steel, pf.	112¼
Va. Car. Chem	49¼

BOSTON EXCH. July 23

Name of Comp.	Clg.
Adventure	8¼
Ahmeek	350
Algomah	5¼
Allouez	46¼
Am. Zinc	31¾
Ariz. Com., ctfs.	6¾
Bonanza	40
Boston & Corbin	‡7¼
Butte & Balak	‡3⅛
Calumet & Ariz	75⅛
Calumet & Hecla	520
Centennial	25
Con. Mercur	01
Copper Range	58
Daly West	5¾
East Butte	13⅜
Franklin	11⅛
Granby	53
Hancock	32
Hedley Gold	16
Helvetia	‡1¼
Indiana	17⅛
Island Cr'k, com.	56
Island Cr'k, pfd.	88¾
Isle Royale	35
Keweenaw	‡13¾
Lake	36
La Salle	7
Mass	7
Michigan	2¼
Mohawk	69
New Arcadian	‡3
New Idria Quick	‡6⅞
North Butte	30¾
North Lake	5¾
Ojibway	4½
Old Dominion	57
Osceola	116⅛
Quincy	90¾
Shannon	16⅞
Shattuck-Ariz	20
Superior	47⅛
Superior & Bost	1¾
Tamarack	40¼
Trinity	5¼
Tuolumne	3¼
U. S. Smelting	45½
U. S. Smelt'g, pf.	49⅞
Utah Apex	2¾
Utah Con	13
Victoria	3¼
Winona	5½
Wolverine	110
Wyandot	2

N. Y. CURB July 23

Name of Comp.	Clg.
Barnes King	.25
Beaver Con	.44
Braden Copper	7⅛
B. C. Copper	5⅜
Buffalo Mines	‡1.40
Caledonia	.40
Con. Ariz. Sm	1⅛
Davis-Daly	2⅛
Diam'field-Daisy	7⅛
Ely Con	.22
Florence	1⅜
Giroux	5
Gold Hill Con	⅜
Greene Cananea	9⅞
Greenwater	.06
Internat. S. & R.	124
Kerr Lake	2⅞
Keystone	2⅛
La Rose	3¼
McKinley-Dar-Sa	1⅛
Min. Co. of A. new	2⅞
Motherlode Gold	⅛
Nev. Utah M. & S.	‡ 03½
Nipissing Mines	7⅛
Ohio Copper	⅜
Pacific Sm. & M	⅛
South Live Oak	‡2¾
South Utah M. & S.	¾
Standard Oil (Old)	980
Stand'd Oil of N.J.	389
Stand'd Oil Subs.	525
Stewart	1⅞
Tonopah	6⅞
Tonopah Ex	2½
Tri-Bullion	½
Tularosa	‡1⅛
Union Mines	⅛
United Cop., pfd.	10
Yukon Gold	3¾

BOSTON CURB July 23

Name of Comp.	Last
Bingham Mines	4
Boston Ely	1
Boswyocolo	.03
Butte Central	6¼
Cactus	.08
Calaveras	2¾
Chief Cons	1¾
Corbin	1⅛
Cortez	1
Crown Reserve	3½
First Nat. Cop	2
Majestic	.43
Mazatan	⅛
Moneta Porc	‡.07
Nevada-Douglas	3⅞
New Baltic	⅞
Oneco	1⅞
Raven Copper	.26
Rhode Island Coal	.20
San Antonio	‡3
S. W. Miami	6½
South Lake	9
Trethewey	.45
United Verde Ext.	.40
Vulture	‡5.00

LONDON July 24

Name of Com.	Clg.
Camp Bird	£1 7s 9d
Dolores	1 10 0
El Oro	0 15 0
Esperanza	1 9 6
Mexico Mines	6 17 6
Oroville	0 5 6
Stratton'sInd.	0 3 1½
Tomboy	1 6 3

‡Last quotation.